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(ESTABLISHED 1777,)

AND

SOUTHERN COUNTIES ASSOCIATION

FOR THE ENCOURAGEMENT OF

AGRICULTURE,

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"He that goes about to forward agricultural improvement must begin by finding out the true reasons of what is called routine, or the 'custom of the country.' It sometimes happens that these reasons are only accidental, and then you may dismiss them fearlessly; but it often turns out that every-day practice rests on a solid foundation of facts; and then if you make an onslaught on local prejudices, they will be sure to beat you.

"The true course for the agricultural improver is, to take one step at a time, to gain a clear insight into facts by experience, not to try to go too fast, and to trust to the work of time.

"If practice which sets up to do without theory is contemptible, theory without practice is foolhardy and perfectly useless."—*From the Rural Economy of England, Scotland, and Ireland*, by LEONCE DE LAVERGNE.

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JOSIAH GOODWIN, Editor,
Bath.

REPORTS AND PAPERS.

I.—*Newport (Mon.) Meeting*, 1888. *Report of the Council to the Annual Meeting.*

THE Council have to report that during the past year, 62 new Members have been elected, but that the Society has lost 57 Members by deaths and resignations. The total number of Members at present upon the Society's books is as follows:—Life Governors and Life Members, 166; Governors, 116; Members, 779; Total, 1061.

Since the last Annual Meeting the Society has sustained no ordinary loss by the death of one of its oldest Vice-Presidents and a Trustee, Sir J. T. B. Duckworth, Bart. For many years, and up to the time of his death, he took a deep interest in the government of the Society, and his wide experience of public business was constantly utilised at Council meetings, over which he was frequently called upon to preside. His valuable services in this capacity, and as Chairman of the Special Committee which some years since did much by its investigations and suggestions to promote the Society's welfare, will long be borne in grateful remembrance by all who have the prosperity of the Society at heart.

The vacancies created among the Society's Trustees by the death of Sir J. Duckworth, and previously by that of Mr. Jonathan Gray, have been filled up by the appointment of Sir R. H. Paget, Bart., M.P., and Sir J. F. Lennard, Bart.

An extraordinary vacancy in the Western Division of the Council has been filled up by the election of Mr. J. H. Ley, of Trehill, Exeter.

On last year's Annual Exhibition the Society sustained a loss of 864*l.*, which, however, the cash balance in hand was sufficient to meet without drawing upon the capital account. The Trustees, under the authority of the Council, have accepted the terms offered by the Chancellor of the Exchequer, and the Three per Cent. Consolidated Stock, which stood in the name of the Society, has been converted into the New $2\frac{3}{4}$ per Cent. Government Stock.

The Council feel it to be a subject of congratulation that one of the Society's Vice-Presidents, Sir R. H. Paget, Bart., M.P., should have been selected to preside over the important Parliamentary Commission on Agricultural Education.

In the Experimental Deparment of the Society's work, a series of experiments was successfully carried out during last year with reference to the effect of manures on the growth of Barley, full particulars of which are contained in the recent issue of the Society's Journal. Experiments of a similar character on the Wheat crop of the present season are in progress, with the view of testing the results obtained in the same direction in 1886; and to meet these expenses a special grant of 300*l.* has been made by the Council. The Society is indebted to many landowners and farmers in various parts of the kingdom, who have not only provided land for the purpose of these investigations, but have carefully and satisfactorily carried out, at no little personal trouble, the scheme laid down by the Experiments Committee.

The Council are very glad to report that the Society's Consulting Botanist (Mr. W. Carruthers, F.R.S.) has made a liberal reduction in the rates of charge for the examination of Plants, Seeds, &c. It is hoped that this will induce Members to avail themselves more fully of the great advantages to be derived from such botanical investigations by so eminent an authority.

In the total number of entries the present exhibition of Stock is considerably above the average. This is due to the satisfactory entry in the Horse and Cattle Classes, Sheep and Pigs being less numerous than usual. The total Stock entries amount to 810, and comprise 130 Horses, 435 Cattle, 160 Sheep, and 85 Pigs.

The exhibition of Dairy Produce is, with one exception, the largest the Society has ever held. It includes 42 entries of Cheese, and 95 of Butter and Cream.

The Poultry entries, which number 429, are not quite so large as usual.

Since the Working Dairy has become a permanent feature of the Annual Meeting, the increasing interest displayed in it by those visiting the Exhibition, and its proved practical utility as an educational medium, have led to its enlargement, alike with regard to its dimensions, and its sphere of operations. Explanatory lectures and demonstrations, with reference to Dairy Husbandry in all its branches both at home and abroad, are being given by recognised experts on each day during the Exhibition. The opportunity of instruction offered by the Society by means of Butter-making Competitions is now largely taken advantage of, the number of competitors having risen from 13 in 1886, to 58 on the present occasion. A useful comparison of the various methods of raising or separating Cream, which was initiated last year, is again being carried out.

As might be anticipated in so favourable a locality as New-

port, the department for Implements, Machinery, and other appliances connected with Agriculture, has reached proportions considerably beyond those usually attained. Most of the leading agricultural firms are represented, the space taken consisting of 812 feet-run for machinery in motion, 206 lineal feet of seed shedding, 3767 lineal feet of ordinary shedding for agricultural implements only, 594 lineal feet of hoarding shedding for cattle foods, artificial manures, &c., 1200 lineal feet of shedding for miscellaneous articles; whilst 15,795 square feet of open space have been taken for hay barns, greenhouses, and other erections.

The extent to which artists have availed themselves of the opportunity for exhibiting their works in the Society's Picture Gallery, testifies that this section of the Art Department is fulfilling the objects for which it was originally instituted, and in this belief the Council have renewed the grant of 100*l*. to the Art Union with the view of promoting the sale of meritorious works. The popularity of the Arts Manufactures section with exhibitors is evidenced by the fact that the Stewards were compelled, from lack of room, to refuse many applications for space. The exhibits include some excellent illustrations of the application of art principles to ordinary manufactures.

The many rare and beautiful plants in the Horticultural Tent render this department of the Exhibition fully equal to its predecessors.

An entirely new feature in the Showyard is a Workmen's Exhibition of models and specimens of handicraft by artisans and amateurs. This originated with Sir T. D. Acland, Bart., whose suggestion was very warmly taken up by the Mayor of Newport, who has liberally contributed several Prizes, and by other members of the Local Committee, by whom the necessary arrangements have been carried out. The entries have been collected at very short notice, notwithstanding which they are nearly 300 in number. In sanctioning its introduction, the Council felt that any help they could give by such means towards furthering the cause of technical education in this country would be entirely in accord with the Society's objects.

The Horse-shoeing Competition is noteworthy this year from the fact that fifty-one smiths have entered, a larger number than on any previous occasion.

The Council have pleasure in announcing that they have accepted an invitation from Exeter to hold the 1889 Meeting there, and a most suitable site has been placed at their disposal.

The Council have much pleasure in recommending that Lord Clinton be elected President for the ensuing year, and that Lord Calthorpe, Mr. H. A. Brassey, and Mr. W. S. Gore-Langton, be elected Vice-Presidents of the Society.

The Council beg to recommend the following for election as Members of Council for the year 1888–90, in room of those retiring by rotation:—

EASTERN DIVISION.—Arkwright, J. H.; Danger, T.; Duckham, T.; Hill, J.; Knollys, J. E.; Maule, M. St. J.; Napier, H. B.; Neville-Grenville, R.; Williams, E. W.

WESTERN DIVISION.—Boscawen, Hon. and Rev. J. T., F.L.S.; Collins, C. R.; Ley, J. H.; Marker, R.; Newbery, S. P.; Shelley, Sir J., Bart.; Williams, Sir W. R., Bart.; Wippell, R.; Wyatt-Edgell, A.

SOUTHERN DIVISION.—Best, Col. G.; Brassey, A.; Druce, A. F. M.; Grenfell, A. R.; Simpson, G.; Stanford, A.; Warre, F.; Whitehead, C., F.L.S.; Williams, A. G. W.

NOMINATED WITHOUT REFERENCE TO DISTRICT.—Allen, J. D.; Llewellyn, E. H., M.P.; Martin, G. E.; Naylor, C.; Rolls, J. A.; Skrine, H. D.

The Council desire to express their thanks to the Mayor of Newport, the Hon. Secretaries and Members of the Local Committee, and the inhabitants of the town and neighbourhood generally, for the cordiality with which they have welcomed the Society, the energy they have displayed in promoting the success of the Meeting, and the liberality they have shown by their additions to the Prize-list, and in other ways.

In conclusion, the Council would earnestly impress upon each individual Member of the Society the desirability of making a special effort to increase the roll of membership, and of bringing home to others, and especially to tenant-farmers, the advantages the Society offers. That very much may be done in this way is shown by the fact that one Member, himself a tenant-farmer, has during the last three years brought eighty new Members into the Society. The attention and interest with which the departure, in the direction of experiments, initiated by the Society three years ago, has been regarded by the agricultural world generally, coupled with the results which have been obtained, have satisfied the Council of the desirability of continuing this branch of the Society's work, whilst, at the same time, they appreciate the necessity of keeping its Stock and Implement Show in the fore-front of agricultural meetings. To this end it is absolutely essential that the Society's income should be fully maintained, but, beyond this, an increasing membership affords substantial evidence of vitality which is in itself a source of influence and strength.

II.—*Report on the Proceedings at the Newport (Mon.) Meeting, 1888.* By R. Henry Rew.

The third visit of the Society to Wales was removed by just thirty years from its first. The first Show held by the Society on the further side of the "Severn Sea" was at Cardiff in 1858. Again, in 1882, a visit was paid to the commercial capital of the Principality, to be followed, after an interval of six years, by a visit to its very flourishing neighbour-port. This was thus the first time that the Society had pitched its tents in Newport, or in Monmouthshire. Many things have happened in the thirty years bridged by this brief chronicle. The period has been eventful both to the Society and to South Wales. In 1858 Newport would scarcely have aspired to receive the Society, less arduous though the undertaking might have been than now. But if the Society has extended in steady progression, Newport has grown by leaps and bounds. In fact it is in 1888 as nearly as possible twice the size that it was in 1858.

In the Report on the second Cardiff Show, published in this Journal,* reference was specially made to the changes which had occurred, particularly in connection with the Implement department, since the first Cardiff Meeting. That Meeting was memorable as being the last at which prizes were offered for implements by this Society. No event of special importance has to be chronicled in connection with the late Show, and although the curious may be interested in comparing the details of the Exhibition with those of the previous Shows in Wales, they may be left to do so for themselves.

The Showyard, which embraced about 33 acres, was situated on a piece of waste land, locally known as "The Marshes," on the banks of the Usk. The site was well chosen for convenience in its proximity to the town, and in the absence of rain would have been unexceptionable. Unfortunately the Show—true to its traditions—was the signal for rain, and the Society bore the first brunt of the weather, which afterwards rendered the summer of 1888 so memorably melancholy. Under those circumstances the Showyard was unpleasantly muddy during the whole time it was open to the public.

In the following pages the several departments are dealt with, as succinctly as possible, so far as the various features thereof may be deemed worthy of permanent record. Generally speaking, the Exhibition may be described as rather above than below the average, in extent, character, and interest. If one

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* Vol. xiv., 3rd series, p. 33, *et seq.*

department may be singled out, it should certainly be that of the Working Dairy, which was again an advance upon all previous Shows. The details respecting it will be found duly recorded in their order.

The Implement Department.

Those Showgoers who, like the Athenians of old, are ever seeking some new thing, would have been probably dissatisfied with the collection of implements and machines at the Newport Show. Except among the appliances for the dairy there was scarcely a noticeable novelty, nor even there was there any machine which could be termed new in principle. There were, as usual, a certain number of "improvements," but these are frequently almost infinitesimal. They are not therefore necessarily unimportant. In the case of a machine which has been brought almost to perfection, a very slight improvement in its details means a very great deal of thought. In the strife for absolute perfection trifles all count. Thus very often the "improvements" which a casual observer might overlook altogether are really worth careful attention.

The Implement Section at Newport bore a curiously close resemblance to that of Cardiff in 1882, with which it is the first impulse to compare it. Except for an increase—of some 33 per cent.—in the quantity of Open Space taken, the figures of the earlier Meeting would almost pass for those of the later. The following is a comparative statement of the quantity and description of space taken:—

	Cardiff, 1882.	Bristol, 1886.	Dorchester, 1887.	Newport, 1888.
Machinery in motion, feet run..	812	1,232	532	812
Seeds, feet run	334	441	256	206
Agricultural Implements, feet run	3,745	4,499	3,757	3,767
Cattle foods, artificial manures, feet run	593	740	478	594
Carriages and miscellaneous articles, feet run	1,377	1,470	670	1,200
Open space for hay barns, greenhouses, &c., square feet	10,575	19,062	13,653	15,795
Total	17,236	27,444	19,346	22,374

Taken all round, the Implement Department at Newport was about as much above that at Dorchester as it was below that at Bristol. The character of the Show is largely indicated by the space taken for machinery in motion. This was precisely the

same at Newport as at Cardiff in 1882, while it was about 300 feet more than at Dorchester, and 400 feet less than Bristol.

As has been said, the Dairying Section was—for its size—the most notable part of the Exhibition. That being so, it will not be out of place to follow the precedent of last year's Report, and give the foremost position to

Dairy Appliances.

It may be fairly said that the Bath and West of England Society has definitely taken up the position which—from geographical association— rightly belongs to it, viz., that of a focus for enterprise in English dairying. The Newport Show was a practical proof of this. The display of Dairy Machinery was not only extensive, but it was almost completely representative. Not only was no established appliance of repute for use in the dairy absent, but all the latest improvements in machines for dairy work were, almost without exception, present.

Messrs. Freeth and Pocock took a prominent position by reason of the novelty of one or two of the appliances exhibited by them. The "Victoria" Centrifugal Cream Separator is the latest addition to the list of machines which adopt the principle of centrifugal force in place of that of gravitation for the division of cream from milk. Messrs. Freeth and Pocock are the sole agents for this machine in Great Britain, and it is manufactured by Messrs. Watson, Laidlaw, and Co., of Glasgow. It therefore possesses the distinction of being the only machine of its class which is of British invention and manufacture. This to patriotic persons will, no doubt, be a testimonial in its favour. The makers, although somewhat late in the field as compared with their rivals, did not come unexperienced to the work of constructing machines of this class. They have long made, on a large scale, centrifugal dressing and separating machines for use in the sugar, chemical, textile, and other industries. The chief advantages claimed for the Victoria Separator are that it is a self-skimming machine, and does not depend for its efficiency upon either pipes or valves; that it is supplied with an automatic feed regulator, which is adjustable so that the quantity and density of the cream may be varied whilst the machine is in motion; that the separating drum will empty itself when the machine is stopped; that the separating drum may be removed for cleaning without disturbing the spindle; that the separating drum has enormous strength, owing to its shape and the material of which it is made—a special forged steel; that the entire machine is very compact, and occupies but little floor space; that the bearings of the counter-

shaft are self-oiling, and provision is made for the lubrication of every other bearing surface; that there are no parts liable to rapid wear, but any part required can always be supplied.

Fig. 1.—*The Victoria Cream Separator.*

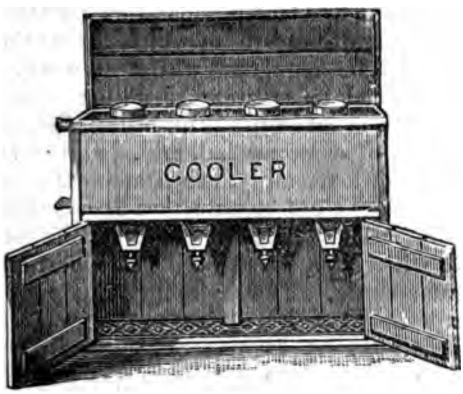
As shown in the Working Dairy, the Victoria Separator had one of Messrs. Freeth and Pocock's cream coolers attached. This is a simple appliance, by which the cream flows over a kind of refrigerating shoot, which contains cold water. Inasmuch as milk is best separated at its natural heat, the immediate cooling down of the cream as it comes from the drum is a very necessary operation.

The Victoria Milk and Butter Tester, also exhibited by Messrs. Freeth and Pocock, is a machine constructed on the centrifugal principle, and consists of a horizontal revolving disc, in which small tubes containing the samples of milk to be tested are placed. Each tube is placed in a case which has a pair of trunnions at the top, by which it is hung on to hooks in a vertical position. The spindle being set in motion by turning the hand-wheel, the case and enclosed bottle immediately fly up into a horizontal position. Whilst in this state

the heavier portions of the milk are separated from the cream, the former being driven to the end or bottom of the bottle, leaving the cream in the narrow neck. Turning the handle at full speed, a few seconds suffice to separate all the cream from the milk. Upon stopping the machine the case falls again into the vertical position; and when the test-bottle is taken out the percentage of cream may be read off on the graduated scale. Four samples can be tested at once. The milk may be tested either cold or warm—the best temperature being from 60 to 70 degrees Fah. It may be tested either whole or diluted with water, proper allowance being made when reading the scale for the water added. The scale is graduated for all milk.

Another novelty exhibited by this firm was the Canadian Cabinet Creamer (Fig. 2). Although not a new apparatus, having been patented in 1879, it has only just been practically

Fig. 2.—*The Canadian Cabinet Creamer.*



introduced among dairymen in this country. It is said to have been long in use in Canada. It may be described as a deep-setting system, in principle similar to the Swartz and Cooley creamers. The cans are, however, fixed in the "cabinet"—from whence its name—instead of being removable as in the other systems. The bottom of each can is funnel-shaped, with a glass front. When the milk has been set, say for twelve hours, the tap at the bottom of the can is turned, and the skim-milk drawn off. When all the skim-milk is gone—as shown through the glass—the cream crock is placed underneath and the cream drawn off. The cabinet in which the cans are fixed is filled with cold spring water, and by this means the cream is raised much quicker than by the ordinary shallow-setting system. It is claimed as a great advantage of this method that the air is

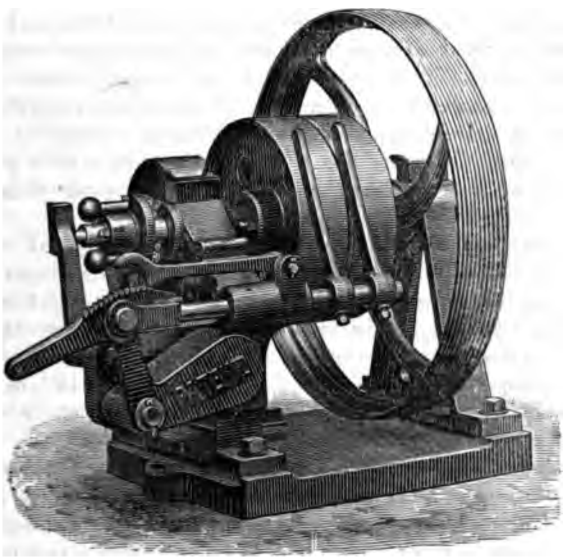
excluded, and the patentee, Mr. Walter Oldfield, of Fouldon, Brandon, states that "Milk when drawn from the udder of a healthy animal is a product of nature, pure and nutritious; keeping it excluded from the air prevents decomposition taking place, and therefore it remains pure as when taken from the cow." It is only fair to other systems to point out that this statement, laid down as an axiom of milk manipulation, is, to say the least, questionable. Absolute exclusion of the air, provided of course that the air be not tainted, is probably neither essential nor desirable. A certain amount of aeration is advantageous to milk, and does not by any means necessarily occasion decomposition. On the contrary, it permits and accelerates the escape of the animal odours which it is by no means advisable to retain in the milk.

The Aylesbury Dairy Company exhibited for the first time—in a Bath and West of England Showyard at least—their new Cream Separator for hand-power. This is constructed on the same principle as their Danish separators for steam and horse power, one of the main features of which is that the consistency of the cream can be regulated whilst at work. This hand separator is designed to separate 15 gallons per hour, leaving only 0·25 per cent. of fat in the skim-milk. It is said to be well within the power of a strong lad, and, judging from the ease with which it ran when empty, this statement would appear to be justifiable. It was unfortunate that it was not exhibited at Newport in operation. A speed of 40 revolutions per minute on the handle will give a speed of 6000 revolutions per minute to the separator drum. The Aylesbury Company are engaged on further experiments, with a view to the greater perfection of their hand separator. A Danish Separator for power, capable of dealing with 115 gallons per hour, was also shown on this stand. This separator, which was invented by Messrs. Burmeister and Wain, was first exhibited in 1881, and is now well known in its main principles. As, however, several improvements have been lately made in it, a brief description of it in its present form may not be inappropriate. It consists of a drum, enclosed in a cast-iron casing, and resting on a spindle, to which the necessary speed is given by a driving strap passing over a floor pinion. A space or chamber is provided for removing the heavier part of the milk, *i.e.* the skim-milk, by an annular plate fixed a little under the cover or top of the drum, a narrow slot or groove being left for the entrance of the skim-milk between the circumference of the plate and the inside of the drum. The milk is, by means of the outlet tube of Professor Fjord's Inflow Regulator, conducted at the bottom of the drum, and, being immediately forced by centrifugal power to

and up its sides, forms what is virtually a cylinder of milk; at the same time the centrifugal force effects a separation of the heavier from the lighter parts of the milk, so that the outer wall of this cylinder is composed of skim-milk, and the inner surface of cream. The skim-milk passes upward through the slot or groove above referred to, into the chamber between the annular plate and the top of the drum, and is drawn off by means of a tube fastened to the cover of the external casing, and bent to reach into the chamber. A similar tube, bent to reach below the plate, draws off the cream. The relative proportions between the cream and skim-milk can be altered during the motion of the machine by sliding the two draw-off tubes lengthwise, backward, or forward.

A useful appliance in connection with the Separator has lately been introduced by the Aylesbury Dairy Company. This is Jönsson's Patent Intermediate Motion (Fig. 3), by means of

Fig. 3.—*Jönsson's Intermediate Motion.*



which any excess of speed due to the breaking of a governor-strap on the engine, or similar accident, is absolutely prevented, thus avoiding such results as the breakage of spindles, main framework, &c. The shaft of the Intermediate Motion is provided with a pair of weighted levers, which, upon the speed

becoming excessive, raise a counterbalance weight, thereby releasing the belt-clutch, and transferring the belt to the loose pulley. A gong is struck at the same time, warning the attendant that the speed of the engine is excessive, and it is impossible to keep the belt on the driving pulley until the speed of the main shafting has become normal. All the "Danish" Separators are now fitted with the Intermediate Motion, and it is also supplied for separators already in use.

Messrs. Pond and Son had a capital collection of the Cheese-making and Butter-making appliances for which they are famed in the West of England. Their new "Dorset Cream-raiser" is one of the cheapest, if not the cheapest appliance for this purpose before the public. It is an adaptation of the shallow-setting system in jacketed pans. The economy and celerity of this principle of raising cream is now generally recognised, and Messrs. Pond have adapted it in a very inexpensive and effective form. The pans are fitted with a simple and ingenious "torpedo" plug for running off the skim-milk.

Messrs. Thyss, Lockyer, and Co. exhibited a number of their phenomenally successful Jersey Creamers. They naturally made full use of their achievement at the Dorchester cream-setting trials, when it will be remembered the Judges placed the Jersey Creamer first in order of merit. The Jersey Creamer differs from the Dorset cream-raiser above mentioned chiefly by reason of the fact that the pans are fitted with covers, which protect the cream from the dust and air, while at the same time they, of course, somewhat increase the cost.

The stand of Mr. George Hathaway was, as usual, noticeable for the array of his celebrated Barrel Churns displayed thereon, while, on the other side of the avenue, at the Working Dairy, he pointed proudly to an imposing regiment of four-and-twenty Shakspearian Churns ranged in order for the butter-making competitions, and all kindly lent by him, free of cost, for the purpose. These famous churns well maintain their reputation for efficiency and reliability.

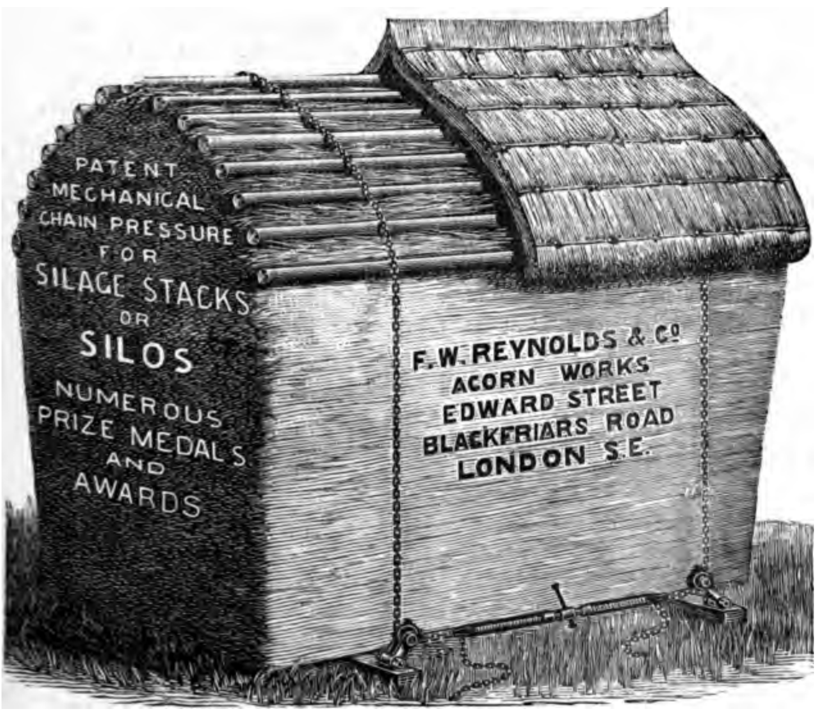
Among other well-known makers of churns whose names must be noted are Messrs. George Llewellin and Son, of Haverfordwest, who had a large collection; Messrs. T. Bradford and Co., who showed all kinds of Dairy appliances and requisites; Messrs. Lloyd, Lawrence, and Co., who also exhibited the famous Cooley Creamer; and Messrs. William Waide and Son, who, in addition to their "Victoria" Churn in various sizes, exhibited a new "Rigmaden Jubilee Victoria" Churn, which is made with two loose lids for convenience of cleaning. Messrs. Vipan and Headly had a number of their celebrated Milk

vehicles, and Messrs. Maundrell and Woodward had a collection of "Paragon" Spring Cheese Presses of simple and effective design.

Ensilage Appliances.

The present year has been remarkable for what may be termed an accidental accession of interest in the subject of Ensilage. The interference with the ordinary course of hay-making, occasioned by the continued rains of the summer months, forced the attention of many farmers to the new method of dealing with their grass crops. This suddenly awakened interest, however, came too late to be reflected in the Showyards. Indeed the wet weather did not begin to threaten until the time of the Newport Show, when the pluvial traditions of the Society asserted themselves as the commencement of a season of exceptional

Fig. 4.—*Reynolds' Ensilage Stack Press.*



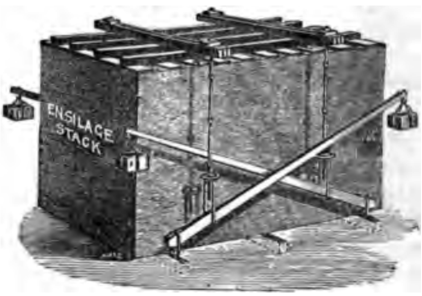
humidity. Could the immediate future have been only foreseen, there would doubtless have been very much more attention

devoted by visitors to the stands on which appliances for ensilage-making were exhibited.

Messrs. F. W. Reynolds and Co., who were among the earliest inventors of pressure appliances for silos and silage-stacks, exhibited on the uncovered ground a development of their Chain system for stacks, which, it will be remembered, was first publicly shown in Mr. Brassey's silos during the Maidstone Show. As arranged at Newport, the appliance consisted of stout chains, placed over the stack at regular intervals, and passed round pulleys at the sides. They are then drawn together by a coupling screw or chain-tightener. The pulleys are attached to beams passing under the stack, and partly sunk in the ground. 7-inch × 2-inch boards, overlapping each other 1 inch, are bolted to the chains, and whilst forming a means of communicating the pressure to the top of the stack, these boards also serve to throw off the rain, and save thatching, or any further cover. The beams under the stack should be kept apart by a strut of timber at each end to resist the pull of the chain-tightener, and a few rough poles or boards should be laid across the beams to prevent lifting. After drawing down one side with the screw, the chains should be fastened to the pulleys by pins put through the chains on the side next the screw, when the chain-tightener can be removed to the other side. Another and somewhat later development of the same appliance is shown in the illustration (Fig. 4). Here the covering-boards are dispensed with, a number of poles being laid lengthwise on the stack to distribute the pressure, and the chains merely passed over them. The stack can then be thatched in the ordinary manner.

The well-known system of pressure invented by Mr. E. T.

Fig. 5.—*Blunt's Ensilage Stack Press.*



Blunt, and sold by the Ensilage Press Company, Leicester, was exhibited on the stand of Messrs. Vipan and Headly. The

principle adopted is that of the lever, by means of which continuous pressure is applied, and the nearest approach to dead weights is thereby attained. Mr. Blunt has devoted great pains and very considerable experience to the development of his system, and has received extensive proof of its practical success.

The "wire-rope" system of pressure, so widely associated with the name of Mr. C. G. Johnson, was shown in a model on the stand of the Aylesbury Dairy Company. Description of the system is well-nigh superfluous, inasmuch as it is now largely in use, not only in this country, but also on the Continent and in the Colonies (Fig. 6). The honours won by this press

Fig. 6.—*Johnson's Ensilage Stack Press.*

include a First Prize of 25*l.*, a Certificate of Merit, and a Silver Medal from the Royal Agricultural Society, and a Special Prize from the Ensilage Society.

Implements and Machines.

There were not many noticeable novelties amongst the general agricultural machinery. A very brief reference to such stands as attracted prominent attention must suffice.

Mr. W. Brenton has improved his well-known "Nonpareil" Mower, and re-christened it the "Nonpareil Jubilee." In its new form it was first shown at the Smithfield Show of 1887. The improvement is mainly in the finger-bar, which is a new patent. It is designed to secure the utmost rigidity of the teeth, and this it seems certainly to effect. The bar has double grooves, in which projections upon each finger of corresponding width find an immovable resting-place, so that the shifting of

the fingers is rendered impossible in the toughest work. No method of bolting can equal this plan for security. The fingers are steel lined, and steel is the material of the cleverly designed spokes of the high road wheels. With reference to the gearing, it should be stated that only one spur wheel and pinion, together with one bevel wheel and pinion, are used, both of large dimensions, and covered and shielded—an arrangement which permits of heavier work than is generally practicable with closed gear machines having small wheels. India-rubber buffers between the pole and the frame give an elasticity to the machine, and prevent any jarring action upon the horses' necks.

The ingenious Bolts which are so widely associated with the name of Brenton, were shown in all their different forms on his stand. They were used by the Society throughout the Show-yard, and it was stated that over 700 had been up to the time of the Show already sold in 1888.

Messrs. Davey, Sleep, and Co., continue to perfect their "Acme" Horse-rake, which has extensive repute. The simple method by which the two end-sections can be quickly taken off, and the width of the rake reduced from 10 feet 6 inches to the width of an ordinary gateway, cannot easily be improved upon. The tipping arrangement had been improved, and there is now a complete hand and foot lock-leverage for either riding or walking. The teeth are specially made of tempered wrought steel, and are so suspended that they readily adapt themselves to the inequalities of the land.

The Chadborn and Coldwell Manufacturing Company exhibited two of their "Excelsior" Corn, Seed, and Manure Drills, which have been widely recognised as a new departure in this class of implements. This drill sows all kinds of seeds, and distributes artificial manures, with perfect regularity and accuracy. The "force" feed ensures precision of delivery, an easily adjustable "gate" controls the quantity, and a dial indicates the amount sown.

On the stand of Messrs. Ransomes, Sims, and Jefferies, Limited, was shown Mayo's patent Straw Trusser, which was awarded a Silver Medal by the Royal Agricultural Society of England at the Newcastle Show (Fig. 7). This trusser is intended to be worked with any steam thrashing-machine, and is placed directly in front of and under the shakers, receiving the straw from the straw-board as it falls. Two lads only are required to work the trusser—one receiving and regulating the straw; the other binding the truss alternately. The string for binding the trusses is cut into lengths, and laid in the receivers ready for use. The ends are secured instantaneously without tying, and, whilst holding the truss firmly, can be readily

eased, and the string used again. The trusser can also be
·d to truss from the stack, filling the receivers by hand. This

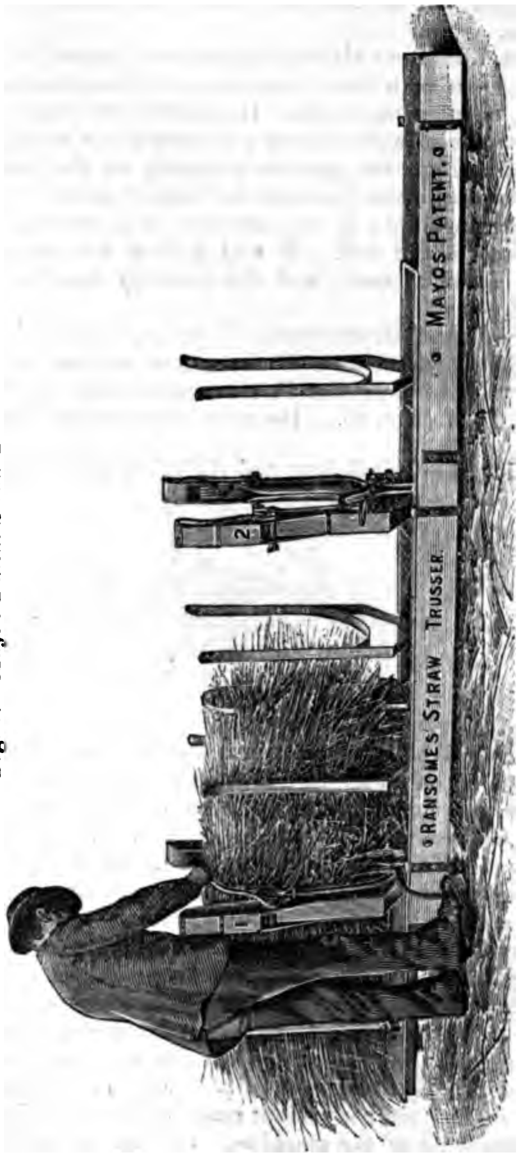


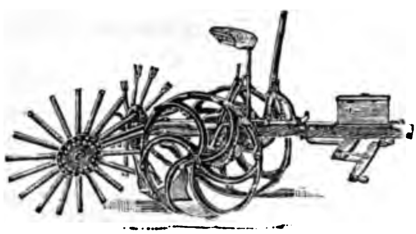
Fig. 7.—*Mayo's Patent Straw Trusser.*

trusser costs only about one-third the price of an automatic string binder, and there is nothing to get out of order, or cause stoppages in the thrashing. String cut from the sheaves bound by a reaper can be used if desired, as knots are of no consequence.

Messrs. Ransomes also exhibited a new patent Sulphurator for dressing hops with flour of sulphur, or distributing lime, soot, gypsum, or other materials. It is driven by chain gearing, and has the spouts adjustable from a horizontal to a vertical direction, so as to distribute the powder uniformly on the bine and leaves of the hops from the lowest to the highest part of the hop poles as may be required; or to distribute the powder uniformly over the surface of the soil. It will deliver on one side only or on both sides at once, and the quantity can be regulated as required.

Messrs. Powell Brothers and Whitaker, exhibited their patent Potato-raiser, which won the first prize of the Royal Agricultural Society of England in the competition at Newcastle in October, 1887 (Fig. 8). Its chief features are that the fork-

Fig. 8.—*Powell Bros. and Whitaker's Potato Raiser.*



wheel, instead of being cast in a straight form, is cone-shaped, with forks set on an angle. By this arrangement the forks work more directly under the ridge, thus moving the potatoes with less soil, and ensuring more perfect work. The number of forks can be varied from six to twelve, to suit the soil and crop. For collecting the tubers in rows as they are lifted by the forks, there is a revolving wheel or cratch, which, it is claimed, arrests them more effectually, and allows the soil to pass through better than the fixed screen used in some machines. Both driving wheels are adjustable on the axle, to suit the width of ridges, and are self-cleaning. The gearing is simple, strong, and well protected, and the speed is gained by spur and bevel wheels, The machine is fitted with a pole and a seat for the driver. Two levers, within convenient reach of the driver's hand, regulate the working of the machine. One on the left hand adjusts

the depth of the share, and lifts it clear of any obstruction, while a shorter one on the right puts the machine in or out of gear.

Messrs. J. and F. Howard have lately still further improved their "Climax" Mower. By the arrangement of ratchets the knife starts at full speed the moment the travelling wheels move. The machine is thrown out of gear by the act of the driver leaving his seat. This is an effectual safeguard against accidents caused by the machine not being out of gear when stopped for clearing the fingers or changing the knife.

Messrs. F. Workman and Sons exhibited a new portable Cider-mill and Double-screw Press for steam power, which had been brought out only some six months previously. This is, it is believed, the first practicable application of steam to cider presses. The mill is fitted with springs, to allow stones or other hard substances to pass through without injuring the mill. The presses are fitted with a worm and worm wheel driving gear, the whole of the gearing and shafts being of steel.

Messrs. W. Warren and Sons exhibited a new patent combined double Sheep and Lambing Feeding-trough, with a self-acting reserve hopper.

Messrs. Samuelson and Co. had several of Roots' new patent "Acme" blowers for smiths' forges and other purposes. These blowers have been before the public for a quarter of a century, but they have lately been considerably improved, as the result of careful experiment. They are now constructed entirely of metal, the revolvers—two in number—being cast entire in one piece, without screws, bolts, nuts, or other parts which can possibly get loose.

A straw trusser is now become an indispensable appendage to a complete thrasher. Messrs. R. Hornsby and Sons, Limited, have arranged for the use of Messrs. Howard's patent—which was also exhibited by Messrs. Howard themselves. Messrs. Hornsby have effected some alterations, which they have protected by patent, so that they thus supply two distinct—though in principle similar—trussers. The Hornsby straw trusser has already been described and illustrated in this Journal.

Messrs. Bradley and Craven exhibited some improved Brick and Tile-pressing machines for steam or hand power. On their stand, and working their machinery, was the largest engine in the yard—a 45-horse power Seller's patent compound single crank, opposite piston travel engine with vertical boiler.

Mr. C. D. Phillips occupied a larger space than any other individual exhibitor. In his seven compartments for machinery in motion he exhibited vertical, horizontal, and portable engines of different sizes, and a large collection of sawing, pumping,

drilling, grinding, brick-making, and other machinery. In the ordinary shedding he also had an extensive assortment of agricultural and horticultural implements, and a special display of the rick struts, waterproof covers, and belting, with which his name is widely associated.

The long array of stands devoted to the display and sale of artificial manures, feeding stuffs, and stock medicines, formed, as heretofore, a prominent and attractive feature of the Show. In walking round the "hoarding shedding," the visitor missed—conspicuous by its absence—the stand of Messrs. Sutton and Sons, which had become almost an institution. The very ornate exterior, and the admirably arranged interior, of the "seed museum" of Messrs. E. Webb and Son was, however, in its usual place, and other competent representatives of the seedsmen were found in Messrs. J. C. Wheeler and Sons, and Messrs. Quibell, Brothers.

THE LIVE STOCK.

As in the case of the Implement Department, so also in the case of that of Live Stock, it is natural to institute a comparison between the Newport Show and the Cardiff Show of 1882. And here, again, we find the figures to be in many respects similar. It is true that the later Show was also considerably the larger, showing an increase indeed of nearly one hundred entries. But this is entirely accounted for in one section alone, viz., that of Channel Islands Cattle. This increasingly popular and attractive class of stock has lately invaded the Showyards in remarkable force. Six years ago the Jerseys and Guernseys together mustered only 65, while at the late Show Guernseys alone displayed within two of that number, and the total of Jerseys was nearly double. Other classes of cattle were in very much the same strength at both Shows, Devons and Sussex having slightly improved their position, and Shorthorns and Herefords remaining stationary. Black Welsh cattle made rather a better display at the earlier Meeting. There was but little difference in the numbers of sheep and pigs, but there was a serious decrease in the entries of light horses, which numbered 129 in 1882 as against 92 in 1888. This was a little compensated for by a slight improvement in the Cart Horse Classes, but once more it must be said that the Horse section of the Show was not such as the Society could be congratulated upon.

The following Table—prepared by the Secretary—records the number of entries at Newport in comparison with that at previous Shows:—

	Cardiff, 1882.	Bridgwater, 1883.	Maidstone, 1884.	Brighton, 1885.	Bristol, 1886.	Dorchester, 1887.	Newport, 1888.
Agricultural and Draught Horses	28	35	54	51	46	33	38
Hunters, Hacks, Ponies, and Harness	129	97	33	107	120	60	92
Cattle, Devons	23	52	36	40	43	56	36
" Shorthorns	78	57	70	65	83	47	80
" Herefords	58	37	36	39	74	47	58
" Sussex	24	36	78	80	48	31	39
" Jersey	36	72	77	183	156	153	122
" Guernsey	29	45	60	93	55	50	63
" Black Welsh	36	..	..	..	..	..	28
" Dairy	7	3	3	34	14	2	9
Sheep	171	207	208	212	190	207	160
Pigs	98	101	86	111	140	130	85
Total	717	742	741	1015	969	816	810

Following the plan adopted last year in reference to the Live Stock, this Report will attempt no more than the stringing together such remarks upon the different classes as the Judges may have sent in response to the invitation of the Council, to furnish explanatory or descriptive notes. The reason for this reticence—as was courteously recognised by the Press last year—is that under the conditions of this 'Journal' any extended notice of the stock exhibited would scarcely be appreciated by its readers. The Reports of the Judges themselves have, in conjunction with their awards, a definite value both for present interest and future reference; but the record of the Show is sufficiently complete when they have added any observations which they may think desirable to the brief chronicle (which will be found in the Appendix) of what they did. It is satisfactory to note that all the Judges of stock have this year duly sent in a Report, although in some cases a little more detail might possibly have been desirable.

HORSES.

For Agricultural purposes.—The Judges of Heavy Horses, Messrs. William Little and Henry Smith, content themselves with a general remark and a suggestion, the latter of which will no doubt receive the careful consideration of the Council.

The Judges regret to say they cannot congratulate the Society on a large entry of Agricultural Horses; nevertheless they found some animals of very considerable merit. If we might be allowed to suggest, a large increase in the number of entries would be made if the Heavy Horse Classes were divided between Shires and other Heavy-bred Horses.

(Signed) WM. LITTLE.
HENRY SMITH.

It may be noted that of the 38 horses in this section, 24 were described as Shires, and 7 as Clydesdales.

Hunters, Hacks, Ponies and Harness Horses.—Mr. M. Angas furnishes the following Report on behalf of himself and his colleague, Mr. T. H. D. Bailey :—

The Weight-carrying Hunters were only three [two of those entered being absent]. "*Conundrum*" [Mr. J. V. Keevil's], the winner, a very useful trade horse, but I should think slow over a plough country. Light-weight Hunters, a poor lot, not one worthy of note. Brood mares, three in number [two absentees]. "*Maid of Mowbray*" [Mr. R. J. Mann's] first, a strong common black mare, with straight shoulders and a bad foal. The other two mares useful. The "*Huguenot*" foal of the second mare a very good one. The Yearling Hunters were a very good class, fourteen in number, nearly all of them promising. The Two-year-old Hunters very good, first and second particularly so. The Three-year-olds comprised several nice young horses. The two first, very nice brown colts.

The Hackney, Driving and Ponies a poor lot. No doubt "The Compton Stand Co." are doing much good; "*Huguenot*" and "*Master Nid's*" stock are very promising, and in a few years there should be some nice horses.

(Signed) Maxwell Angas.

Cattle.

Devons.—The Judges of Devon Cattle, Messrs. S. Bailey and J. Forrester, thus report by the pen of one of them :—

The Devon Cattle generally are very well represented (with the exception of the Old Bull Class, numbering only two), and quite up to their usual standard of excellence. And it is quite evident their superior quality over other breeds generally is giving them a good position in the eyes of our foreign neighbours, who I find this year are purchasing freely for America, South Africa, and other parts.

(Signed) Stephen Bailey.

Shorthorns.—The Judges of Shorthorns, who were also responsible for the Dairy Class for Cows of any breed, presented the following Report :—

There is always a great interest taken by breeders and exhibitors of stock at the Bath and West of England Meeting. Several large county Shows having taken place a few weeks before, naturally makes the contest at this exhibition very keen amongst the Shorthorn breeders, for here we had the best specimens of the breed from England, Scotland and Ireland.

The animals in most of the classes were of exceptionally high merit; if we attempted to describe the best in each class it would only be a repetition of many good ones.

We much regret the Society does not allow a third prize in large classes of good animals. Our thanks are due to the obliging Secretary, and for the attention given us by Mr. A. F. M. Druce, our good working Steward.

(Signed) John Thompson.
Mattw. Savidge.

Herefords.—The following detailed and interesting Report

was sent in by the Hereford Judges, Messrs. W. Groves and H. Haywood:—

Class 39.—No. 247 [Mr. Keene's "*Three R's*"], first-prize, is long in body, short-legged, has good substance, but is not perfect in the hind quarters. No. 252 [Messrs. T. Fenn and W. Tudge's "*Viscount Wilton*"], second-prize, is stylish and symmetrical, but is rather small, and lacks width of body. No. 250 [Earl of Coventry's "*Clarion*"], reserve and No. 251 [Earl of Coventry's "*Rondeau*"], highly commended, are large, and the latter much too fat.

Class 40.—No. 258 [Mr. J. Price's "*Prince Alfred*"], first-prize, is long, low and massive, true-formed, covered with smooth and level flesh, and is quite first-class, and easily won the Championship for Males. No. 256 [Earl of Coventry's "*Golden Miner*"], second prize, has a capital back, and is a good specimen. No. 259 [Mr. J. Tudge's "*Alton*"], reserve, is stylish, but too low in condition to show to advantage.

Class 41.—No. 261 [Mr. A. E. Hughes's "*Royal Head*"], first prize, is large and of good character and style. No. 263 [Earl of Coventry's "*Royal Ruler*"], second prize, is thick-set and shapely. No. 264 [Mr. Rankin's "*Gaylad*"], reserve, has good style and substance, but is backward in condition. No. 267 [Mr. H. F. Russell's "*Sir William*"], highly commended, is a nice one, and of good future promise.

Class 42.—No. 275 [Mr. J. W. Hayter's "*Brunette*"], first prize, is a fine cow, has great substance, with a fine coat, and has thick and level flesh. No. 276 [Mr. W. Tudge's "*Bella*"], second prize, is a grand specimen of a breeding cow. No. 273 [Mr. Rankin's "*Fortune Teller*"], reserve, is fine and stylish, in low condition. Nos. 270, 272 and 277 were all commended.

Class 43.—No. 283 [Mr. Taylor's "*Cardiff Lass 2nd*"], first-prize, is a beautiful heifer, but having recently produced a calf, is not in her best form. No. 278 [Col. Bridgford's "*Princess*"], second prize, has immense width of body, but is much too fat. No. 279 [Mr. Palmer's "*Lightfoot*"], is a grand one, but greatly over-fed.

Class 44.—No. 285 [Earl of Coventry's "*Rosewater*"], first prize, is remarkably true-shaped, with great substance, and well won the Champion Prize for females. No. 287 [Mr. Tudge's "*Lady Wilton*"], second prize, is large and good. No. 288 [Mr. Russell's "*Her Majesty*"], reserve, is stylish and symmetrical.

This is a good Class, and all are Commended.

Class 45.—No. 297 [Mr. R. Green's "*Jenny Lind*"], first-prize, is of good size and style, and has rich flesh and handling qualities. No. 293 [Mr. Hughes' "*Princess*"], second prize, is of true form and nice style, but is small, and the touch over the loin is far from good. No. 290 [Mr. R. Keene's "*Blanche Bangham*"], third prize, is fairly level, but lacks style. No. 298 [Mr. J. Vaughan's "*Lady 9th*"], reserve, is a nice heifer. Nos. 289, 291, 292 and 296 all received commendations.

The Class being large in numbers, and many of great merit, we recommended a third prize.

We do not consider the "Aged Bull" and the "Cow" Classes quite up to the usual standard of merit. The other Classes are highly creditable.

(Signed) William Groves.
H. Haywood.

***Sussex*.—The Judges of Sussex Cattle, Messrs. A. Agate and G. Napper, reported as follows:—**

Taking into consideration that the Bath and West of England Society held their meeting at Newport, Mon., adjoining the Welsh border, there was a very creditable display of Sussex cattle. In the first class that came before us we had no trouble in placing No. 310 [Mr. Forster's "*Mikado*"] first, a bull of good substance, though we should have liked to have found him more mellow in handling. No. 305 [Messrs. Wood and Son's "*Oxford 2nd*"] was second, a nice short-legged animal, and the reserve went to No. 309 [Sir F. Montefiore's "*Gold Dust 9th*"].

CLASS 47.—In this we awarded first prize to No. 311 [Mr. Waterlow's "*Gentleman*"]. There being only two entries in this Class no second prize was given. In the Yearling Bulls (Class 48) there was a very good entry. After due consideration we placed No. 314 [Mr. J. S. Hodgson's] first, a very nice animal, and likely to be heard of again. No. 313 [Mr. Heasman's "*Goldfinder*"] ran him closely, but had to be content with the second place. There were several other nice youngsters in the Class, especially No. 319 [Mr. Forster's "*Nero*"].

CLASS 49.—Only three cows were entered, and we had no difficulty in placing them, as the first, No. 323 [Mr. Waterlow's "*Elsa*"], is, in our opinion, one of the best Sussex cows that has been shown for some years. No. 321 [Mr. Hodgson's "*Laura 7th*"] is a very heavy-fleshed cow.

CLASS 50 brought four competitors, which we placed as follows: first, No. 324 [Mr. Hodgson's "*Laura 8th*"]; second, No. 327 [Mr. Field's "*Birdseye*"]. All four were good representatives of their respective herds.

CLASS 51.—The Two-year-olds were a very fair lot. No. 332 [Mr. Forster's "*Parade*"] was placed first, an animal of great size and substance for her age, and likely to make a good cow. No. 329 [Mr. Godman's "*Comely 9th*"] was a good second, from the well-known Park Hatch herd; the reserve number was No. 328 [Mr. Hodgson's "*Young Emily 2nd*"].

CLASS 52. *Heifer Calves.*—We awarded the first prize to No. 343 [Mr. Field's "*Primrose*"], a nice short-legged animal of good quality, that will no doubt be seen again in the Show-field. This Class was well filled, and several animals were of exceptional merit.

(Signed) GEORGE NAPPER.
ALFRED AGATE.

Jerseys.—**The following exhaustive Report on these well-filled classes was presented by Messrs. W. Ashcroft and A. T. Matthews:—**

The well-filled classes of Jersey Cattle submitted to us possessed good merit; animals of inferior character being for the most part few and far between.

CLASS 53.—A small but fair Class of Old Bulls. No. 347 [Mr. Brutton's "*Dog-Fox*"], an excellent bull with good lines and general character, good touch, well-marked escutcheon and teats well placed, was easily first, although not remarkable for richness in colour. No. 349 [Lord Ashburton's "*Baron de Rullecourt*"], took second prize, an animal of good quality not in such high condition as the others. Third prize went to Mrs. Brogden's "*Secret,*" a large bull of good appearance, rather coarse in the horn. Reserve number to No. 348 [Lord Ashburton's "*Martin St. Peter's*"], a useful bull, somewhat high on the tail.

CLASS 54. *Bulls calved in* 1886.—First prize No. 358 [Mr. Corbett's "*Franciscan*"], an excellent bull of very neat and symmetrical character, with no coarseness, yet not lacking substance; his good touch, well-marked escutcheon, and long, well-placed false teats, ought to leave their mark in the

dairy. No. 353 [Earl of Londesborough's "*Marius*"], a well-made bull, slightly broken-coloured, with good sprung ribs and many good points, rather heavy in the head, took second place. Third prize went to [Mr. Tucker's "*Golden King*"], a rather heavy bull of objectionable colour, but looking likely to get good rich milkers. Reserve numbers to Nos. 359 [Miss Peel's "*Royal Blue 2nd*"], a nicely made bull. 357 [Mrs. Perkins's "*Baron Wolseley*"] highly commended, a straight, long, good animal. Nos. 354, 357, and 362, commended, showed good dairy points.

CLASS 55. *Bulls calved in* 1887.—First prize we gave to a long fine bull, No. 370 [Mr. Simpson's "*Bessie's Boy*"], with kind head and the type to produce good milkers, who will improve with a little more flesh. Second prize to No. 371 [Mr. Simpson's "*Monopolist*"], a neat rich bull, but not of the same lengthy character. Third, No. 373 [Mr. Fowler's "*Denlzia's Duke*"] a nice young bull, finer in horn and bone, but not so rich in colour, ran up close for second honours. Reserve went to a straight neat bull [Mr. Budgett's "*Frisky*"], of good promise. No. 363 [Mr. Cornish's "*Leonora's Laddie*"] fully deserved his high commendation, which may also be said of Nos. 364, 369, and 378, the commended bulls in this class.

CLASS 56. *Cows calved before* 1885.—First prize we awarded to No. 388 [Mr. Simpson's "*Rosy 3rd*"], a handsome, promising young cow with first-rate general appearance, very neat, possessing well-proportioned milk-vessel with good veins. No. 387 [Mr. Simpson's "*Bessie*"], a much older cow, a trifle uneven on her top-line, with a beautiful udder and fine points, showing every appearance of a deep continuous milker, took second place. Third prize to No. 383 [Mr. Budgett's "*Prima Donna*"], a lengthy, ladylike cow of good Jersey type, and rich milking points. Reserve number to a very symmetrical old cow [Mr. Budgett's "*Black Bess*"], with an exceptionally good udder. Nos. 397, V.H.C.; 392 and 393, H.C.; 379, 381, 382, 383, 395, and 398, C., helped to make up a class of very good cows.

CLASS 57. *Heifers calved in* 1885.—No. 404 [Mr. Corbett's "*Stargazer 4th*"], and No. 400 [Earl of Londesborough's "*Governess*"] headed this class, a pair of thoroughly good English type Jerseys, showing substance without coarseness. These heifers, much alike in appearance, ran one another close for first place; but No. 404, though slightly deficient in fore bag, carrried more good points, and was by no means unworthy of the Gold Medal which she afterwards won. Third prize went to No. 406 [Captain Le Brocq's "*Rosanna 2nd*"], a dark, lengthy heifer, fine in horns and bone; and the reserve number to No. 407 [Captain Le Brocq's "*Clara of Highlands*"], a fine promising milking heifer.

CLASS 58 *Heifers calved in* 1886.—A large and on the whole good class of two-year old heifers. No. 411 [Mr. Cornish's "*Try 2nd*"], a heifer of handsome appearance and fine capacious udder, is placed first, closely followed by No. 412 [Mr. Cornish's "*Madeira 3rd*"], a heifer with not such good touch, and heavier in the horn. Third prize was awarded to No. 423 [Mr. Fowler's "*Carlo's Leeta 2nd*"], a very promising milking heifer of fine character. Reserve number to a heifer [Mr. Simpson's "*Pandora 11th*"], somewhat disfigured by a high hindquarter, but with a fine milking head, good touch and good udder. No. 426 [Mr. Fowler's "*Test Me 2nd*"], V.H.C., on the point of calving, looked a promising milker. Nos. 413, 425, 432 and 435, were highly commended, and three others received commendations in a generally good class.

CLASS 59. *Heifers calved in* 1887.—A large promising class of young animals, 26 in number. A dark-coloured calf, No. 465 [Mrs. Crooke's "*Selection*"], not fattened to the extent that so many of these young animals unfortunately are, with good head, fine neck and forehead, very promising udder and well-shaped teats, and good marked escutcheon, was placed first. Second and third prizes went to Nos. 449 [Mr. Simpson's "*Lady Godiva*"], and 450 [Mrs. Perkins's "*Lady Prim*"] respectively, both high enough in

condition, and running close to one another in merit. These two heifers we could not agree upon, and they were placed second and third on reference. Reserve number 457 [Mr. Corbett's "*Emily E.*"], in a big class, lengthy and of good character, deserves her place; and there were entries in this class worthy of commendation.

The exhibits of this breed being so numerous, we highly approve of the new departure of the Society in giving third prizes, in fact, in some of the numerous young classes if the prize money were divided into four it would be a still further improvement.

(Signed) WILLIAM ASHCROFT.
ALFRED THOMAS MATTHEWS.

Guernseys.—The Judges of Guernsey Cattle, Mr J. Carré and the Rev. J. G. S. Nichol, reported as follows:—

On the whole we found the Guernsey Classes well filled, and a decided increase in the numbers of last year's Show at Dorchester.

The Old Bull Class was not well represented, and we had no difficulty in selecting No. 466 [Mr. Glynn's "*Hopeful*"], for the first prize. He is an active, good-looking bull, and quite maintained the character he has established on former occasions. The second prize was awarded to No. 468 [Sir. F. Montefiore's "*Sir Francis*"], a well-shaped, good-coloured animal, with perhaps too much flesh. The reserve number was given to No. 469 [Express Dairy Company's "*Sterling*"], a large beefy bull, better than the remaining one, No. 467 [Mr. Long's "*Cloth of Gold 17th*"], but we did not consider either of the latter good specimens of the breed.

In CLASS 61.—*Bulls calved in* 1886—six were brought before us. No. 470 [Mr. Morris's "*Norman*"] was unquestionably an easy winner of the first prize. Between the second and third we had some hesitation, but the undoubtedly better position of the teats of No. 475 [Sir F. Montefiore's "*Valentine*"] decided us to award the second prize to him, though we considered No. 474 [Mr. Tucker's "*Marc Antony*"] to be a very shapely bull and of good colour. None of the others were in our opinion deserving of award.

CLASS 62. *Bulls calved in* 1887.—Seven were forthcoming, and one, No. 481, was absent. The animal to whom we awarded the first prize [Mr. Morris's "*Phœbus*"] had splendid teats, and though smaller than some of his competitors, surpassed them all in this point, and also displayed quality and colour. The second prize [Col. Macleay's "*Clovis*"] was a light-colour, good-quality bull. No. 477 was R. and V.H.C., and 480 Commended. Though this class was fairly well filled, the general quality was below the mark.

In the Cow CLASS—*calved before* 1885—seven animals were brought into the ring. The cows selected were all milked out in our presence. No. 484 [Mr. Morris's "*Flowery 2nd*"], though almost dry, having calved so long ago as August last, showed great milking properties, and a soft silky bag free from all superfluous fat. The second prize, No. 485 [Mr. Morris's "*Blossom*"], is a shapely, good-looking cow with a nice udder, and much more recently calved. The reserve No. 488, was also V.H.C., and No. 490, about which we had no information as to age and date of calving, was Commended.

CLASS 64. *Heifers calved in* 1885.—No. 491 [Mr. Morris's "*Rose Myra*"], was a very fine heifer, and easily won her position. No. 497 [Sir F. Montefiore's "*Grandeur 2nd*"], was a very nice typical Guernsey, and made an excellent second. Nos. 495, R. & V.H.C., and 499, Commended.

CLASS 65—*Heifers calved in* 1886—was a large muster of 11. No. 501 [Mr. Morris's "*Frederica 4th*"] was a good first; she was also awarded the "E. Guernsey Cattle Society" silver medal. Nos. 509 was second; 510, R. &

V.H.C.; 503, H.C.; 504, 508, were Commended. In this class the competition was not very keen.

CLASS 66. *Heifers calved in* 1887.—This had the largest number in any of the classes brought before us, and contained some excellent specimens. We venture to express our opinion that these young things are in some cases overfed, which we think must act detrimentally afterwards. The first prize, No. 518 [Mr. Long's "*Colonia 1st*"], and the second, No. 519 [Hon. Mrs. Baillie-Hamilton's "*Florence 3rd*"], were very nice calves, and look like taking honours in future years. No. 512 [Mr. Morris's "*Sundew*"], R. & V.H.C., was also a very promising animal. This Class turned out well. We are of opinion that it would be a great improvement as well as an encouragement to exhibitors if the Society would offer a third prize in all the classes, not by increasing the prize money, but by subdividing what the Society allots to the Guernsey cattle into three instead of two prizes in each class.

The Silver Medals of the E. G. C. S. were awarded to Nos. 466, Bulls; 485, Cows; and 501, Heifers.

(Signed) J. G. SCRYMSOUR NICHOL.
JOHN CARRÉ.

Black Welsh.—The following Report was presented by the Judges of the native breed, Messrs. T. Owen and E. Vaughan:—

In all the Classes of Welsh Cattle we found a show of excellent beasts. Indeed the quality was so good, that we had considerable difficulty in adjudging the prizes. Welsh Cattle, taking into account the beef-making and beef-producing qualities, are certainly taking a front place, and there is manifestly much improvement in the breeding of this class of stock. The great difficulty we had arose mainly in the Cow Class from the two qualities above mentioned not being always so appreciable in the same animal. We felt, however, that it was right to give consideration to both beef and milk, and hence the difficulty to which we draw attention. We hope these remarks will not be lost on the breeders of this Class, for we are sure they will find the benefit of keeping the points referred to prominently before them.

(Signed) THOMAS OWEN.
ED. VAUGHAN.

Any Breed.—The Dairy Class for Cows of any breed or cross, contained eight entries, all of them Shorthorns, of apparently good milking character. The Shorthorn Judges awarded the prizes.

SHEEP.

Longwools.—Messrs. C. Clarke and R. Garne judged the classes for Leicesters, Cotswolds, Devons, and other Longwools, and presented the following Report:—

CLASS 75. *Leicesters.*—There were four entries in this Class, but nothing to call for particular comment.

CLASS 76.—Three entries. The first prize lambs [Messrs. J. & D. Linton's] showing as much Leicester character, as anything in either of the Leicester Classes.

CLASS 77.—The first-prize pen of Ewes [Mrs. Perry-Herrick's] were a level nice lot.

CLASS 78. *Cotswolds.*—The first-prize animal [Mr. Swanwick's] in this

Class was a good sheep, with great size and good form, combined with good wool. The second prize [Mr. Swanwick's] was rather weak in neck. The reserve sheep [Mr. Swanwick's] looked like making most improvement, but was rather light in wool.

CLASS 79.—The first-prize lambs [Mr. W. Thomas's] were big and good looking, showing a deal of character. Nothing else in this Class calls for any comment.

CLASS 80.—The Shearling Ewes in this Class call for no particular comment.

CLASS 81. *Devon Longwools.*—There were some very good sheep in this Class. The first-prize animal [Sir J. H. Heathcoat-Amory's] was a fair type of the breed, with good wool but slightly loose in his mutton. The second-prize sheep [Mr. A. C. Skinner's] was well made, with good mutton, but rather light in wool.

CLASS 82.—This Class was very well represented, both first and second prize lambs were very promising.

CLASS 83.—Only three entries, but they were very good specimens of the breed.

(Signed) ROBERT GARNE.
CHARLES CLARKE.

Southdowns, *Hampshires* and *other Shortwools*.—The Judges of these classes, Messrs. E. Baunton and J. A. Hempson, reported thus:—

Southdowns.—Classes only fairly represented, and, with exception of two or three pens in each class, there is a want of quality, especially in the wool.

Hampshires. Shearling Rams.—A fairly strong Class, with some strong useful sheep. *Ewes.*—First pen good quality, very nice touch, and well shown; all strong good ewes. *Ram Lambs.*—Some useful exhibits. Nothing calling for special notice.

(Signed) JOHN A. HEMPSON.
E. BAUNTON.

Shropshire, *Oxfordshire Down*, *Horned* and *Mountain Sheep*.—Messrs. C. Coxon and W. D. Little, the Judges in this section, presented the following Report:—

The Shropshires this year are not so numerous as on former occasions, neither are they upon the whole so good, although there are several entries of exceptional merit.

CLASS 92 contains twenty entries. The prize sheep is true in type and form, with good wool, but not quite masculine enough. The second-prize sheep is large, with good head, and legs well put on. The reserve number sheep is a very improving animal, with beautiful wool.

CLASS 93. *Pair of Ram Lambs.*—This is anything but a good class; the prize pen are small, but are true in type. The second-prize pen contains one lamb of exceptional merit.

CLASS 94. *Five Shearling Ewes.*—This class only contains three exhibits. The first-prize pen are long, roomy sheep, with good Shropshire character and wool. The second-prize pen are improving sheep, true in type and a good match.

CLASS 95. *Oxfordshire Down.*—In a small Class of seven entries only, some capital sheep were exhibited, the prize pens being representative of their breed.

CLASS 96.—The Ram Lambs were a fairly good class, but none of the exhibits call for any special remark.

CLASS 97.—In this Class (Shearling Ewes) only one prize was awarded, on account of insufficient entries. The prize sheep were very good.

CLASS 98. *Somerset and Dorset Horn.*—The prize pens in this Class were good; all the exhibits were commended.

CLASS 99.—In this Class only one prize was awarded, the other two entries being disqualified owing to their being over the prescribed age.

CLASS 100.—In the Shearling Ewe Class there were some remarkably good specimens of this hardy and useful breed of sheep, the quality of the mutton of the prize pens being exceptionally good.

CLASS 101. *Mountain Sheep.*—This Class (Rams) being open to either shearlings or rams of any age, the entries comprised rather a mixed lot, the type of sheep being as varied as the ages of the exhibits.

CLASS 102.—Amongst the Shearling Ewes of the Mountain breed there were a few very good pens.

(Signed) CHARLES COXON.
W. D. LITTLE.

PIGS.

The Judges of Pigs, Messrs. J. Barron and E. Burbidge, reported as follows:—

CLASS 105.—Small entry. First and second two fair pigs; the reserve pig probably the best stock animal, but shown out of condition.

CLASS 106.—A better Class.

CLASS 107.—This was a good Class. We found the two best animals to which we awarded the first and second prizes were coloured contrary to the rules of the Society. We would suggest for the future that the Classes of Berkshires and Blacks be inspected in front of Judges. In this Class we would recommend a third prize.

CLASS 108.—Moderate Class. First and second good specimens, but badly marked.

CLASS 109.—Only one entry.

CLASS 110 and 111.—Only two entries in each class, but specially good animals.

CLASS 112.—No entry.

CLASS 113.—Two fair animals in this class; the best pig much spotted.

CLASS 114.—Only one fair pig.

CLASS 115.—A fair Class; considerable diversity of type.

CLASS 116.—The pigs to which we awarded first prize were not the heaviest for the age, but we considered them the truest type.

CLASS 117.—A moderate Class.

CLASS 118.—Only two entries.

CLASS 119.—A good Class. We should recommend a third prize to be awarded here.

CLASS 120.—Only three entries. This (Middle Whites) being a manufactured breed, is a difficult Class to judge.

CLASS 121 and 122.—Small Classes. Nothing special.

CLASS 123.—A good Class. We recommend a third prize to be awarded in this Class. All the animals were fairly true to type.

CLASS 124.—Only three pens exhibited.

(Signed) JOHN BARRON.
EDWARD BURBIDGE.

It devolved upon the Stewards, on behalf of the Society, to take decisive steps for the protection of the general body of exhibitors in the Pig Classes. It is not needful here to enter into a discussion or description of circumstances which have been happily rare in the Society's Showyards. It suffices to record the fact that the Stewards having satisfied themselves that the regulations of the Show had been deliberately infringed, and the good faith upon which entries are necessarily received distinctly violated, not only disqualified the animals sent by the inculpated exhibitor, but debarred him from entering in future at any Show held by the Society. The Show system rests very largely on the accuracy and integrity of the statements made by competitors, upon whom there is in the main no effective check except their own sense of honour. When therefore a breach of these conditions occurs under circumstances, which in the minds of the Stewards, admit of no honourable explanation, they do no more than their duty in taking summary measures. And such a duty—it is needless to point out—is entirely in the interests of exhibitors who compete on the faith of the observance of the regulations, and of the members of the Society who are entitled to know that the prizes offered in their name are fairly awarded.

THE WORKING DAIRY.

After a certain stage of success has been attained in the pursuit of any enterprise, further efforts tend to become even more arduous. The political economists' "law of diminishing returns," or of increasing difficulties, has a wide application. It is comparatively easy to win a certain position, but it is often more difficult to hold it steadfastly and to make it the vantage ground for yet greater achievements.

The Working Dairy of the Bath and West of England has entered upon the stage when its own reputation is its keenest rival. This department of the Annual Show was in 1887 generally admitted to be admirably arranged, and excellently carried out. The problem for 1888 was to improve upon the previous year. And here, so well was the Dorchester Dairy thought out, came the difficulty. However, the task was undoubtedly achieved, and by sundry small but significant improvements and additions, a still further step was taken towards the ideal of perfection which the Dairy Steward has evidently set before him. The main lines of the previous year were adhered to. Periodical lectures and illustrations were given

each day, competitions for butter-makers were arranged, and a further comparative test of different modes of raising and separating cream was instituted.

The building itself was an advance upon all previous buildings for the purpose. The agricultural editor of *The Field* commented upon "the most complete working dairy we have ever seen in any show-yard, in a large building—picturesque and cool—in its deep covering of wheat straw," and this high testimony was very generally endorsed by other competent critics. The dimensions of the building were—outside measurement—90 ft. by 60 ft.; floor space (for actual work), 60 ft. by 24 ft. The area covered was about 12 ft. more each way than in the previous year. There were capacious galleries on two sides of the dairy which were continually crowded by the public when anything of interest was going forward. The attendance of visitors may be indicated by the fact that over 70*l.* was taken for admission, at 6*d.* per head, and that on several occasions large numbers of persons could not be admitted for want of space. At one end of the building was a counter for the sale of samples of the prize cheese, and at the other were offices for the steward, and for the butter-makers and attendants. The "experimental dairy," in which the cream from the competitive systems was placed under lock and key, was a small detached building, standing some few yards from the Working Dairy itself. In another detached but adjacent building the separated milk was sold. The main building was deeply thatched with straw; the large quantity used for the purpose being generously given by the President, Lord Tredegar. The "separated milk shed" was covered with Phillips' patent lockjaw roofing tiles, kindly lent by Mr. C. D. Phillips. The fittings and arrangements of the dairy were very complete. As an instance of the small details whereby forethought manifests itself in the endeavour to attain perfection, may be cited the provision of Hindley's steam quieters for the hot water tank, which effectually prevented the annoyance occasioned by the noise of heating water by steam without these useful little appliances.

The equipment of the dairy was, as heretofore, accomplished by the aid of several firms who lent the various appliances and utensils. Foremost was the Dairy Supply Company, to whose managing director, Mr. G. Barham, the thanks of the Society are again due, not only for the loan of some of the most important machines, but also for his own personal attention and assistance in the Dairy. Among the machines lent by the Dairy Supply Company were an A1 Laval separator, capable of separating 90 gallons of milk per hour. This was driven by

the ordinary gear from the steam-engine, but a separator of similar capacity was shown, which was fitted with the new turbine attachment, which is fitted in the base, and is driven by a jet of steam. By this arrangement the employment of the cumbrous and sometimes dangerous intermediate motion and belts is avoided. A valuable addition to the Laval separator is a new milk warmer, in the form of a bell-shaped cylinder over which the milk flows on its way into the drum. This cylinder, being jacketed, is readily heated by a jet of hot water. The object is to raise the heat of the milk (in cases where it is not separated immediately as it comes from the cow) to a natural warmth, as it is at that temperature that the quickest and most complete separation of the cream can be effected. A Laval hand-power separator of the vertical type (described in the last volume of this *Journal*) was also shown. A new development of the Laval separator was shown in the "Baby," which may be worked by a lady, and will separate 12 gallons of milk in the hour. This last-mentioned ingenious adaptation of the separator principle marks, one would think, the extreme limit to which the reduction of motive power can go in this direction. It is well suited for small dairies or home butter-making, but its capacity is of course too small for the ordinary dairyman. The hand Delaiteuse and the hand Lactocrite, useful adaptations of appliances which had hitherto been only available where power was used, were also shown by the Dairy Supply Company. The same enterprising Company further lent the Swartz deep-setting system, a number of railway churns, and most of the smaller utensils of the dairy.

Messrs. Freeth & Pocock lent their new Victoria separator, which was brought out for the first time at the London Dairy Show in the previous year, and is described in the Implement Section of this Report.

Mr. G. Hathaway again lent all the churns used in the butter-making competitions, and, ranged in polished order before the dairy to the number of two dozen, they made a goodly show. The twenty-four butter workers used in the competition were lent by Messrs. Llewellin of Haverfordwest. The [illegible]dcliffe Iron Company lent the cisterns and buckets, and Messrs. Titley & Sons of Bath gave the fine dairy salt used in the competitions. It may be added that Hansen's rennet was used by Professor Long in his cheese-making demonstrations. The motive power for the dairy was supplied by a six-horse power vertical engine of the well-known type associated with the name of Mr. E. S. Hindley.

The daily work of the Dairy consisted of demonstration, instruction, and competition. These three methods, each in its

own way effectively educational, divided attention throughout each day. There was the exhibition, at stated hours, of the separators and other appliances used in the dairy. This was of course attended by explanations from those in charge. Miss Connell, of the Cheshire Dairy Institute, and Professor Carroll, of the Glasnevin School, gave practical illustrations of the improved modes of butter-making. The making of Devonshire cream, which was carried on each day at one end of the dairy (one of Varden's stoves being used for the purpose), was also a matter of interest to many visitors. On the first day of the Show the trial of different methods of separating or raising cream was publicly commenced, and on the last day of the show it was publicly concluded. This interesting part of the work is dealt with in a separate article (p. 39) by one of the Judges; but it may be mentioned here that no less than 25*l.* was received in entry fees from the competitors.

Professor Long gave on each day an illustration of the making of soft and foreign kinds of cheese. The demonstrations in connection with his lectures were carried out by Mr. Benson, the winner of the only diploma given by the British Dairy Farmers' Association for the science and practice of dairying. Professor Long dealt with the manufacture of the well-known French cream cheese, the "Mignon." This was made from skim or separated milk. The latter produced two cheeses, weighing from 14 oz. to 16 oz. per gallon of milk, or, in the case of very ordinary milk, per five quarts. The richer the milk the less the quantity required. In the presence of the public this cheese was made, square metal moulds being used, one at the bottom, the other at the top. These moulds were placed on a straw mat and beech board. When the curd has been brought into the condition known to makers as "fit," it is removed into the moulds and allowed to remain until it has sunk into the bottom mould, whereupon the upper one is replaced on a straw mat and clean board and the cheese reversed. In the course of twelve hours it becomes sufficiently solid to dispense altogether with the mould. Having then been salted, it is ready for the market. As regards consumption, it is best in four or five days in the summer and eight or nine in the winter. After a description of the process of making cream cheese, the size and form of which were exemplified by the exhibition of a battery of little moulds, the lecturer proceeded to speak of the Gorgonzola cheese of Italy. Professor Long declared that he was of opinion that this cheese could be profitably produced in this country, especially as the sale of it was becoming very considerable, so that English consumers were, perhaps, unthinkingly patronising foreign makers to the detriment of the home trade.

Professor Long also gave four lectures on subjects in connection with dairying. These, like his demonstrations, were well attended by the public and listened to with much interest. It would of course be out of the question to report his utterances in anything like detail, but a few notes may be recorded of some of the salient points. On the first day of the Show, the subject of the lecture was "Dairy Cattle; their feeding and management." The merits and demerits of the Shorthorn, Angus, Red Polled, Kerry, Channel Island and Welsh breeds were discussed from a butter and cheese-making point of view. The difference in constitution of the morning and evening milk was referred to. The importance of a study of food rations, and their judicious adaptation to the purpose in view, was urged upon the dairy farmer. The respective advantages of grazing and stall-feeding in summer were compared. Reference was then made to certain forage crops useful for growth where stall-feeding was practised. Lucerne and tares were specially mentioned, and it was pointed out that these crops were equally adapted for soiling in summer, or for making into silage for winter keep. The modes of winter feeding were described with special reference to silage, steaming and cooking. The value of straw as a food when fermented or steamed was insisted upon, and the lecturer also urged upon the dairy farmer who wished to get the best profit from his herd, the mistake of selling all his best hay, and feeding only the worst to his cows.

On the second day of the Show, Professor Long's subject was "Milk, Cream, and Butter." He explained the composition and properties of each and what could be done with them, and showed the process by which one was gradually turned into the other. He pointed out that necessarily the best system of milk separation was that involving the minimum loss of butter fat and the minimum period of time, for if the process lasted long there was danger that the skimmed milk could not be sold as such. Passing under review the various methods of cream extraction, he strongly advised the abolition of the old-fashioned plan of placing the new milk in shallow vessels and permitting the cream to gradually rise to the surface. This occupied 30 to 48 hours, a period unattended by unpleasant effects in the winter, but in summer the skimmed milk was liable to turn sour soon after the skimming had been done. In these days of keen competition it was needful that the farmer should lose none of the butter fat nor the milk from which the cream had been extracted. Hence the prudence of acquiring the best machinery that his means permitted. By means of the centrifugal apparatus exhibited in the dairy it was possible to extract

the cream from the milk when it was fresh from the cow, so that, besides utilising all the butter fat, the skim-milk was available in sweet condition. The lecturer then set forth the characteristics of such systems as the Jersey, the Devonshire, and the deep-setting, explaining their defects as compared with the newer method they had seen. Incidentally he advised farmers to make the cows calve down, not in spring as was generally done, but between July and August, and to make their butter as much as possible during the winter months, when prices ruled high.

The other lectures delivered by Professor Long were on "Butter-making at home and abroad," and "English Cheese-making."

It should be mentioned that two Swedish dairy-maids—who had been brought by the Dairy Supply Company to give demonstrations at the Glasgow Exhibition—were present in the Working Dairy, and their illustrations of the national mode of butter-making attracted considerable interest.

There were three butter-making competitions, followed—on the last day of the Show—by a "championship" competition for winners in the previous contests. On Thursday the competition was for females and four prizes were offered. There were twenty entries. One competitor was absent, but her place was taken by one of the Swedish dairy-maids, although she was, of course, not eligible to compete for the prizes offered. Among the competitors were three of the successful competitors at Dorchester, viz. Miss Moss, Miss R. Hassell, and Mrs. King. The following were the awards and details:—

		Temperature of Churning.	Time taken in Churning.		Net Weight of Butter.	
		deg.	h.	m.	lbs.	oz.
1st.	Miss Moss, Bath	58	1	16	6	8¾
2nd.	Mrs. Lear, Broad Clyst	60	1	1	6	3¾
3rd.	Miss Hassell, Englesbatch ..	57	1	14	6	7¼
4th.	Mrs. Holmes, Tonbridge ..	59	0	56	6	13
Equal 5th.	Mrs. Ford, Tisbury	58	1	11	6	3¼
	Miss Jones, Bridgwater	58	1	10	7	1½
H. C.	Miss Davey, Cannington	60	1	0	6	3¼
	Miss Keel, Stanton Drew ..	58	1	27	6	4¾
	Mrs. King, Chew Magna	58	1	50	6	15
	Miss Maidment, Wells	57	1	17	6	5¼
	Miss Williams, Chew Stoke ..	58	1	33	6	8½
	Mrs. Williams, Winford	62	1	21	6	6½
C.	Miss Fowler, East Harptree ..	59	1	52	6	10¼

The quantity of cream supplied to each competitor was seven quarts.

It may be interesting to note the mean results achieved by

the thirteen successful competitors. These work out thus: Temperature 59°; Time 1 h. 19 m.; Weight of butter 6 lbs. 8¼ oz.

The Judges (Professor Carroll and Mr. Rigby) specially recommended the two extra (fifth) prizes on account of the excellence and evenness of merit. They also awarded an extra prize of ten shillings to the Swedish dairy-maid—Miss Pottersson, of Stockholm—in recognition of the skilful manipulation and good quality of butter produced. They did not, however, commend her method of making, one prominent fault being the use of the hands in working. Of the whole competition they expressed their appreciation of the general improvement shown over the previous year, an improvement which they attributed largely to the educational effect of these public competitions.

The second competition (on Friday) was for males as well as females, all but three of the competitors of the previous day again taking part, and being joined by four men. The following were the results:—

		Temperature of Churning.	Time taken in Churning.		Net Weight of Butter.	
		deg.	h.	m.	lbs.	oz.
1st.	Miss Keel, Stanton Drew ..	58	0	54	5	9½
2nd.	Miss A. Williams, Chew Stoke	58	0	59	5	8½
3rd.	Mrs. Lear, Broad Clyst	59	0	48	5	13½
4th.	Miss Hassell, Englesbatch ..	58	0	53	5	12½
Equal 5th.	Miss Moss, Bath	58	0	47	5	13½
	Miss Davey, Cannington	57	1	0	5	11½
	Mr. Boulton, Clifton	59	1	4	5	9½
H. C.	Miss Fowler, East Harptree ..	59	1	6	5	8½
	Mrs. Williams, Winford	57	1	3	5	14½
	Mr. Benson, Stevenage	60	0	44	5	3½
	Mrs. King, Chew Magna.. ..	58	0	58	5	9½
	Miss Maidment, Wells	57	1	8	5	11½
	Mr. Gray, Clifton	57	1	10	5	7½
C.	Miss Barron, Derby	59	1	1	5	13½
	Mrs. Holmes, Tonbridge	58	1	0	5	13½
	Miss Jones, Bridgwater	57	0	57	5	13½
	Miss Pottersson, Stockholm ..	60	0	58	5	11½
	Miss Winter, Chedzoy	58	0	52	5	8½

The quantity of cream allotted was six quarts each.

The mean of the records of the 18 successful competitors in this class is: Temp., 58°; Time, 58 min.; Weight, 5 lbs. 10¾ oz. Again the merit displayed was so high, that the Judges recommended the award of extra prizes—viz. three equal fifth prizes. A commendation was awarded to the Swedish dairymaid, who took part in the competition. It may be observed that Miss Pottersson churned at a noticeably slower speed than any of the other competitors. It would, by the way, add to the

instructiveness of the records of these competitions if the speed of churning could be taken in each instance. Possibly arrangements may in future be made for noting this.

On Saturday the competition was arranged under the following conditions:—"Best and largest quantity of butter, made from a given quantity of cream, in any method most suitable for a small dairy, open to males and females. This class is especially intended for the instruction and encouragement of those keeping a few cows." The greater number of the females, and one of the men who had previously competed, again entered, only one new competitor presenting himself. The results were as follows:—

		Temperature of Churning.	Time taken in Churning.		Net Weight of Butter.	
		deg.	h.	m.	lbs.	oz.
1st.	Mrs. Lear, Broad Clyst	58	0	55	4	10
2nd.	Mrs. Williams, Winford	59	1	11	4	8
3rd.	Miss Hassell, Englesbatch ..	60	1	7	4	12
Equal 4th.	Miss Keel, Stanton Drew ..	60	0	58	4	10
	Mrs. Ford, Tisbury	60	0	46	4	10
Equal 5th.	Mrs. Holmes, Tonbridge	60	1	10	4	2
	Mrs. Collins, Weston-super-Mare	58	0	50	4	10
H. C.	Miss Fowler, East Harptree ..	59	0	52	4	7
	Miss Goulstone, Bristol	58	0	59	4	7½
	Mrs. King, Chew Magna ..	58	1	0	4	8
	Miss Maidment, Wells	57	1	3	4	9
	Miss Williams, Chew Stoke ..	58	0	53	4	8
	Miss Winter, Chedzoy	58	1	2	4	3
	Mr. Gray, Clifton	57	1	1	4	4

The quantity of cream supplied was five quarts.

Here again two extra prizes were awarded, showing the continued closeness of the competition.

On the last day of the Show the final competition took place. This was confined to prize winners in the previous competitions, and very great interest was aroused in the contest. The prizes offered were three in number, and consisted of—1. A Gold Medal, 2. A Silver Medal and Certificate, 3. A Certificate. The results were:—

		Temperature of Churning.	Time taken in Churning.		Net Weight of Butter.	
		deg.	h.	m.	lbs.	oz.
1st.	(Gold Medal) Miss Hassell ..	58	1	10	4	0
2nd.	(Silver Medal) Miss Keel ..	58	1	7	4	0
3rd.	(Certificate) Miss Davey	57	1	10	4	4
H. C.	Mrs. Williams	57	1	23	4	0
	Mrs. Lear	59	1	17	3	14

The quantity of cream allotted to each competitor was four quarts, and the following are the means of the "championship" records:—

Temperature, 57°; Time, 1 h. 13 m.; Weight, 4 lbs.

The character of these competitions is significantly indicated by the awards of the judges. In every class, they bestowed additional honours. In one class, out of twenty-two competitors, only four failed to obtain some notice from the Judges. Upon such facts comment is superfluous.

It should be stated that no stress can be laid upon the comparative weights of butter made from the different quantities of cream in each competition, as the quality and thickness of the cream were not uniform throughout. It must always be borne in mind that the circumstances of a public competition are quite exceptional, and form no absolute guide for home practice, except as regards the principles exemplified.

One or two notes taken at the Working Dairy during the week may be added in concluding this brief account. The whole of the milk used during the week, amounting to something like 500 gallons per day, was supplied by the Gloucestershire Dairy Company. At one of the public discussions which took place during the Show in the Dairy, Professor Carroll made a point which evidently told upon his audience, and which deserves permanent record. He was contending that the great requirement of the present day was to "level up" the general average of British produce. He urged that it was to the interest of all, not only to improve their own produce, but to improve also the produce of their neighbours—not, in short, to adopt a selfish policy. He said, "100 lbs. of good butter does no good to a district, but 100 tons of good butter raises prices generally in the district." And a voice from the crowd extended the moral with the remark, "the same with cheese." On the same occasion Sir Thomas Acland clinched the remarks of Professor Carroll, by urging that the demands of the consumer, as expressed by the great middlemen, deserved the respectful attention of dairymen. The demand, he said, is for uniformity, and it is because the home market does not meet this demand that trade has so largely drifted to other markets where it is studied and supplied.

III.—*On obtaining Cream from Milk. Tests made in the Working Dairy of the Bath and West of England Agricultural Showyard at Newport in June*, 1888. By THOMAS RIGBY, Sutton Weaver, Cheshire, *viâ* Warrington.

ONE of the still debateable points in some of the counties of England, the northern in particular, is whether the best and the most butter can be got from churning whole milk, or only the cream. The decision in favour of the latter is being more clearly given daily, but there is yet much to be taught before it will become universal. In the southern counties it has been favourably decided, and almost universally, for some years. The more debateable points there and now are as to the best system or *mode* of separation, and the Committee of the Society did well when they decided upon instituting these trials. They erected a milk-house or store-room near the Working Dairy in the Showyard, and obtained the loan of a quantity of dairy vessels to carry them out efficiently. All was provided that practical knowledge and foresight saw necessary and that attention could supply, and no trouble or expense was spared to attain a correct issue. The systems tested were seven in number, known as the "Victoria Cream Separator," an adaptation of the centrifugal action adopted by De Laval; the "Canadian Cabinet Creamer," an adaptation of the "Cooley" system in a more complete form; the Danish or "Scwartz" system; the "Jersey Creamer"; the "Rymer Pan"; the "Shallow Pan," and the "Devonshire System of Creaming." Two of these, the "Canadian" and the "Scwartz," act on similar principles to each other—the reduction of the temperature of the milk quickly by pouring it into deep narrow vessels and placing them in iced water up to their rims as soon as drawn. Two others, the "Jersey Creamer" and the "Rymer Pan" (which is a German invention), pursue an opposite plan, their vessels are shallow pans with hollow or jacketed sides and bottoms, into which hot water is first put to raise the temperature of the milk to upwards of 100°, then drawn off and immediately replaced with iced water. One of them, the "Jersey," has an arrangement of pipes and taps by which hot or cold water is made to flow constantly through similar outer spaces, but the water in the "Rymer" can be changed only by personal labour. The "Devonshire" system was worked on a similar but more elaborate plan, as is afterwards shown. The "Shallow Pan," the oldest and most simple of all processes for obtaining cream, was originally a circular earthenware vessel, 10 inches to 12 inches deep, and 4 inches to 6 inches wider at

top than bottom. Then it became a circular tin vessel of from 14 inches to 18 inches diameter and 6 to 8 in depth, but almost upright in the sides. The Pan exhibited was made of tin, was oblong in shape, 44 inches long, 26 inches wide, and 6 inches deep, and was placed upon a bench that stood 2 ft. from the floor.

In the trial of these systems on June 6th the following particulars were observed. Two-thirds of the milk used had been drawn from the cows the previous night and one-third that morning. It had all been cooled at the farms from which it came, by a Lawrence's Refrigerator, and sent by road and rail into the Showyard, when it was poured into one of the large circular vats used in the making of Cheddar cheese. At twelve o'clock 14 gallons of this milk was dealt out to each system by a measure of 2 gallons full being poured into seven tankards in succession, the milk in the vat being kept stirred to secure entire uniformity. This was done seven times round. Four of the agents, or exhibitors of the methods competing, superintended their own vessels. The "Victoria Cream Separator," worked by steam, was conducted by its agents, Messrs. Freeth and Pocock, who heated the milk dealt out to them to 84° and passed it through the Separator in 35 minutes. The machine was fitted with an ingenious arrangement for cooling the cream as it ran from the milk, which reduced it to 68°. The cream after separation was placed in a small tankard and set under a padlocked lid to stand in a Scwartz cistern containing iced water, and 2 bottles of the separated milk were put aside in the Dairy to be sent with the skim-milk of the other systems to Dr. Voelcker for analysis. The manager of the "Canadian" system poured his milk into cylindrical cans fixed in a water-tight cabinet, having a conical-shaped bottom, filled with water. The "Scwartz" system was superintended by the Dairy manager of the Society in the ordinary way, as was also the "Rymer" and the "Shallow Pan." The milk was poured into the Scwartz deep pans at 12.30, the iced water in which they stood being then 53° temperature. In the "Rymer" pan the milk was raised to 100° by hot water being poured into the hollow sides, and was then reduced, by the substitution of cold water with ice in, to about 60°, and so left. The "Shallow Pan" had the 14 gallons of milk poured into it at its temperature of 62°, which filled it to the brim all round. The "Jersey" system was most skilfully managed by its agent. The milk was first raised to 110° by hot water, then quickly reduced to 58°, and so left with cold water running from a cistern round and under the apparatus. In the "Devonshire" system the milk was poured into small circular pans at 64°, and placed in the Dairy store-room until 4 o'clock, when it was

raised to 168° by being placed on boiling-water in the pans it stood in until it reached this heat, when it was replaced in the store-room and covered with an open-cloth cover. All the samples stood as thus placed until 8 o'clock on the night of the 7th, when each lot was skimmed of its cream, which was placed in small tankards separately, and then put with that first taken by the separator. A sample of about a pint of separated milk taken from each system was then put into bottles and labelled, and, with that obtained from the separator, was sent to Dr. Voelcker for analysis.

The separating of the cream from the milk required skilful treatment on the part of the Agent in the "Jersey" system and in the "Canadian" also. The success of the systems must always depend largely upon this. The former was well and quickly done, but the latter was done clumsily. There was indeed little separation. Nearly as much milk as cream was collected by the attendant and placed aside for churning. The "Rymer Pan" and the "Shallow Pan" both allowed the milk to run from under the cream, the latter being collected with tin scoops. The "Scwartz Pans" require a specially made skimmer, and intelligent handling to get all the cream off, as it lies in a thicker layer than on the other pans, and is more mixed with the milk. This was well done, however, by the Society's dairymaid. The Devonshire cream was taken off in thick layers, but perfectly sweet, and so inviting in appearance as clotted cream as to suggest to the Judges to ask, "Could not this cream be put on the market in this state?" There would surely be a large demand in London for it if it could be offered there in the clean white earthenware jars the dairymen exhibit. On Monday, the 11th instant, the seven lots of cream were churned by seven of the dairymaids who had been most successful in the previous churning competitions. One lot of cream—the "Canadian Creamer's" produce—required two churns to deal with it, the quantity being too large for one, but all the other lots were dealt with in one churn. The cream was over-ripe in one or two instances, and in all it was older than it would be allowed to become in the best Dairies before churning.

The following weights of butter were got out of the several lots of cream :—

From		lbs.	oz.
No. 1.	The Victoria Cream Separator	4	13
„ 2.	Jersey Creamer	4	12
„ 3.	Rymer Pan	4	12
„ 4.	Shallow Pan	4	9
„ 5.	Devonshire	3	15
„ 6.	Canadian Creamer	3	14
„ 7.	Scwartz System	3	10

The greatest weight of butter came from the cream drawn by the Mechanical Cream Separator; the next heaviest from the systems that first raise the temperature of the milk moderately high, and then reduce it quickly when setting to stand for cream. Why the Devonshire system yielded the lowest in weight of butter in this trial may be explained by the fact that the stove on which the milk was heated did not "draw well," and did not therefore admit of as rapid a rise in heat as was wanted and as is got on fixed boilers at farmhouses. A similar apology should also be made, perhaps, for both the "Scwartz" and the "Canadian" systems. The heating and the cooling was not managed as efficiently as might have been, and probably less butter was got through this. The "Jersey Creamer" is more costly than the "Rymer Pan," and that again than the plain "Shallow Pan," and both are more difficult to keep clean and to arrange in the best position for success.

The accuracy of the trial was confirmed by the analysis of the skimmed or separated milk which had been sent to Dr. Voelcker. The milk sample No. 1, the Doctor reported, contained only ·11 parts of fat; No. 2 had ·33; No. 3 had ·53; No. 4 had ·40; No. 5 had 1·01; No. 6 had 1·05 and No. 7 had ·98. These figures represent the amount of fat found in 100 parts of milk after the cream had been extracted as described. The "Devonshire" system evidently abstracts a quantity of caseine from the milk with the cream, and the butter was of a slightly cheesy texture and flavour. Its cream is its most valuable product, and appears to be very promising for further developments. The other two systems which showed the lightest weight require ice or very cold water to develop all their advantages. An ice-house or an ice-making machine is a necessity in the "Scwartz" system, and the "Jersey" and "Rymer" would do better with one near at hand. In drawing conclusions, or making a selection from the systems named in this or similar trials, regard must be had to all the local circumstances that may directly or indirectly influence the result. The principles to be checked are of a very subtle character, and will require repeated trials before being fully proved. One leading fact at least is clearly demonstrated—that the mechanical separation of the cream yields the best results. From this and other trials it is found that more cream is extracted by this method than by any other, and the milk which is left behind must be sweeter and more valuable than that can be which stands 24 or 36 hours. The analysis of Dr. Voelcker, as well as the results of the churnings, show that all the cream, or very nearly all, is got out by the Separator, and as all the

keeping to get the cream top is avoided, a sweeter butter and sweeter separated or skimmed milk is obtained.

The next best principle to observe in separating cream from milk, as shown in these trials, is to raise the natural heat to 100° Fahrenheit or upwards, and then to cool it down quickly. The theory may be that the heating expands the milk and makes all its parts more active; the lighter parts, the globules of cream, obey their natural law and ascend to the top, and when the contracting influence of the cold water is felt, the heavier portion, the water, the sugar, and the caseine, descend quickly, and so hasten the entire separation. Since these trials the writer has seen the principle applied to three open pans fixed one above the other; the separated milk being run from under the cream in the top one into the second pan twelve hours after the whole milk was first heated, and the result, on repetition twelve hours after, leaving very little butter or fat in the so skimmed milk. It is important to obtain the separation without breaking or bursting the globules of the cream, and the more delicately milk can be treated always the better. The rapid speed at which milk revolves in the Separator prevents abrasion or rough usage of parts to a large extent; but in the more natural manner of separation, hastened, as is shown, there is even more gentleness, and it may be better quality of cream is obtained, and so better butter may follow. The whole subject shows how necessary it is that the dairymaid should watch all points that affect quality during manufacture, and in the results obtained.

IV.—*Some Practical Points in Butter-making.* By Professor JAMES LONG, Gravely Manor, Stevenage, Herts.

IT is extremely difficult in these days of severe competition not only to successfully meet the foreign producer in the butter market, but to make a profit by the manufacture of butter. It naturally depends very largely upon the district in which a producer lives; upon the facilities which he possesses for manufacturing milk at home or buying it from his neighbours. There are articles of consumption the prices of which are much better regulated than the produce of the dairy, for, strange as it may seem, it is possible to buy butters of high quality, which compare very closely in their character not only in different parts of the country, but in different districts, at prices which vary in an extreme degree. During the past winter I have had numerous opportunities of comparing the qualities and prices

of butter in different parts of the country, and from this experience I am bound to believe that the general character of British butter is improving, although there does not appear to be a commensurate improvement in the price. In London and its neighbourhood in particular, I can point to dairies from which butter is sent out, realising 1*s*. 4*d*. to 1*s*. 8*d*. per lb., and to others which produce an equally good article at from 2*d*. to 4*d*. per lb. less; whereas French and Italian butters have to my certain knowledge been sold as low as 13*d*., although their quality has been equal to that of any of the British samples to which reference has been made. I understand from those engaged in the wholesale trade this low price of the Continental butter is owing, in some measure, to the competition between the French and the Italian makers. The latter, in order to obtain a foothold upon the London market, have had to tempt the dealers with low prices, and the quality having been found sufficiently satisfactory, the French have in self-defence been obliged to reduce their prices to meet the case. Italy is not at present an important butter-consuming country, and those who have travelled through it, especially in Tuscany and in Piedmont, to say nothing of the more southern states, will endorse my remark that the native butter is, as a rule, of the most inferior and oftentimes uneatable kind. In Lombardy the complaint cannot be made to the same extent, for during the past few years great efforts have been made by a number of energetic men of business, not only to establish butter-factories, but to increase the output, and to improve the quality generally in their respective neighbourhoods. I have personally seen something of the great efforts which are made in the neighbourhoods of Reggio in Emilia, and of Lodi and Codogno. Italian butter now reaches this country with great rapidity, and we must be prepared to receive it, and to do our best to beat it, although the prices which the Italians are willing to take, and which the French will in consequence be compelled to take, are not such as the British farmer will willingly accept if he expects to make a profit under the conditions upon which he farms at the present moment. I sometimes feel that we have greater reason to fear the competition of these two countries than that of Denmark and the other Scandinavian countries, for the simple reason that the French and Italian butters are mild, and adapted to the tastes of those who can afford to pay high prices, and especially to the requirements of the large hotels and similar establishments throughout England; while the butters of the eastern countries are more generally purchased by the lower classes, and especially by the operatives in our northern towns, and the mining and similar classes in the country districts, where strength of flavour

and salt appear to be more generally approved than mildness and delicacy of flavour.

From time to time some doubts have been expressed as to the relative merits of the home dairy and the butter factory. Whether the butter factory will ever be able to pay its way without obtaining high prices for its produce or not, it is impossible to say at this early period of its history; but it is a question whether it will be able to maintain such prices, even though for a time it may be fortunate enough to receive them. On the other hand, it is not difficult to show, indeed the fact must be well known to numbers of people, that there are plenty of farmers, and landowners as well, who are making a high class article, and who are invariably able to obtain a first-rate price for it. The great cry for uniformity of quality has undoubtedly had much to do with the formation of factories. I should be sorry to suggest for one moment at this stage of their career that this uniform article is going to pay the producer best. At all events it places him in direct antagonism with the foreign maker, and the factory has first of all to prove that it can make a better article than the best Normandy butter, an extremely difficult thing to do, and next to show that it can sell it at a lower price. I have been told by some of the largest caterers in London that there is no sentiment in business, and that they are compelled to obtain the best article at the lowest price, whether it comes from France or Italy, or whether it is produced in our own country. The factory then has the opportunity of supplying small customers who take very few pounds a week, as well as the wholesale class, which includes the retailer, the hotel-keeper and the consumer in other large establishments; but in this instance he is obliged to compete with the foreign product, and he may or may not succeed, but success itself must in many instances mean a trifling profit. When we come to the case of the factory supplying the private consumer, it is evident that we shall find other difficulties arising, as compared with those which exist in the case of the farm producer who weekly leaves his produce at the very door of the customer, and takes his money away with him. There is neither the regular system of sending orders to the factory, of transmitting money through the medium of the post office, of paying the carriage of the goods as they arrive by rail, or of sending to the station to meet them, for I conclude that a factory with a large number of private customers must necessarily despatch the great bulk of the orders by railway, a proceeding which interferes with the profit, and which gives a certain amount of trouble to both parties to the transaction. But there is more than this; there is the extra cost of butter-paper or cloth, of correspondence, and

of the package; for whether a box or a basket is sent, it must either be charged for or returned at the cost of the consumer. This, as every one knows who has been accustomed to despatch dairy produce by rail, entails occasional difficulties when empties go astray or never arrive at their destination.

All these facts point to the conclusion, that, inasmuch as the private butter-maker can obtain high prices, if he is well skilled in his business and has the capacity of marketing well, he will beat the factory, and that it will be to his interest to make his own milk as rich as he can, to keep it at home to manipulate it in the best possible manner, and to make and sell his own butter. Let me refer to a case in point, for details of which I have to thank the manager of a factory which is well conducted. The average quantity of milk produced is 500 gallons daily, and the price paid varies from *5d.* to *7d.* per gallon, notwithstanding the fact that during the past winter, dealers in towns have been too glad to pay *10d.* per imperial gallon. The milk is of fairly good quality, and at the dearest season of the year the factory was glad to take *14½d.* per lb. for its choicest butter. It is probable that in some factories a percentage of the butter is sold at a high price, and that the balance, probably more than half, is sent out for what it will fetch, a limit of course being fixed. The suggestion that naturally arises is that a factory should work up its business, and that it should never manipulate more milk until the butter produced is all sold at a maximum price, and there is a demand for more. This appears to be the system adopted at Lord Hampden's factory, near Lewes, where some 600 gallons of milk have been received daily, and where an exceptionally high price is paid per gallon, the price of the butter varying between 1*s.* 2*d.* and 1*s.* 6*d.* per lb., according to the season; the lowest price, as I am informed by the manager, having only been maintained for two months, the second price, 1*s.* 4*d.* for two months; while the third price, 1*s.* 6*d.*, is maintained right through the winter. This is probably the reason why Lord Hampden is about to make a considerable extension to enable the staff to get through a greater amount of work. I can mention friends of my own to whom it has been a great pleasure to give some little assistance when they started their work, who are also selling all they can produce at 18*d.* per lb., and who, by the adoption of the best appliances, by following the most approved system in the management of their cattle and their dairy generally, are able to produce much more butter per cent. than they did before, going into dairy work in earnest, instead of leaving it to their employés.

The Carse of Gowrie Factory at Dundee is an example of the kind of dairy which appears to me to be worthy of imitation,

although perhaps its unusual success is owing to the ability of its manager, Mr. W. A. Smith, who informs me that the average quantity of milk daily received is 2000 gallons, an average of 1000 gallons being daily separated, a portion of the cream being sold, and the rest being made into butter, which realises 18*d.* per lb. The cost of separating the cream at this dairy, making the butter, and retailing it, is only ½*d.* per lb. This is something like good work. Cheese is also made in the season at a cost of ¼*d.* per lb., whether it be made of skimmed or new milk. There is one feature in connection with this dairy which is especially worthy of notice, and may not be found out of place in these remarks. Milk-bread is made upon a large scale. Mr. Smith kindly sent me a sample loaf, together with a Scotch scone, and a small bread-cake. Although three days upon the road, each was not only delicious, but perfectly fresh, and it was remarkable how long and well the bread kept. Fifty gallons of skim-milk is daily used in the bakery instead of water, this paying 4*d.* per gallon. Having a penchant for bread of the highest quality, and with some experience of the best English makes, as well as those obtainable abroad, I confess to have seldom eaten anything with greater relish than the samples to which I have made reference. There are some extremely good factories, which in one sense remind me of the Dundee dairy, at Kiel and at Brunswick in North Germany. Although they are upon an extensive scale, yet, as in the Scotch case, they retail their own milk and butter, and also buttermilk and cheese, which is made upon the premises. I was once enabled to inspect another establishment of the kind at Berlin, this being one of the largest of which I have ever heard. Here some eighty waggons are sent out daily with milk and butter. The butter is made in three qualities, the second having originally been the first, while the third has passed through both the first and second stages; in a word, the second is that which has been returned unsold, and is made up fresh and sent out again, while the third quality is butter which has been twice sent out and returned.

Recently visiting a number of farms in the East Riding of Yorkshire, I came across an instance in which a new tenant, residing within a measurable distance of a sea-side town, had started a dairy of some five-and-twenty cows. My host's wife was the interested person, and in a short conversation upon farming matters, during which the dairy was introduced, the question was put in a most marked and searching manner, "Do you think butter-making pays?" Naturally such a question should be answered in terms which are especially applicable to a particular case, for the prices obtainable for butter and skim-

milk vary so much, as well as the breeds of the cows and their yield, and the method of feeding them, that any generally composed reply would be most misleading. Let us, however, take ordinary farm milk requiring about 28 lbs. to produce a lb. of butter which obtains 18*d.* in the market, the skim-milk selling at ½*d.* per quart, a price which is not always obtainable even in country villages, where the demand for skim-milk is, I believe, growing, although the ordinary farm labourer and his wife in the districts with which I am acquainted are by no means so partial to it as a beverage and as a food as they are to beer. The sale of the butter and of 2½ gallons of skim-milk—indeed this quantity would be barely obtainable—would realise the sum of 1*s.* 11*d.*; whereas the same quantity of milk sold direct from the farm to the dealer in a town within measurable distance would, after the cost of carriage had been deducted, return 2*s.* 0¾*d.* Although winter prices are being paid, it must be remembered that if the farmer chooses to give up his contracts, and to sell at high prices when he can get them, he can often get a penny per gallon more for his milk than I have suggested. The best class of dairying to follow is that which makes a man entirely independent of either the butter, the milk, or the cheese trade. He should be able to undertake either the one or the other at a moment's notice, and it will pay him to do so. It must, however, be mentioned that there is all the difference, from a profitable point of view, between producing milk for sale and milk for butter. I know one of the most accomplished farmers and milk-producers that it is possible to meet, who has openly declared that his business is to make as much milk as he possibly can by the use of stimulating food, for as long as milk passes a given standard, it is not to his interest to further enrich it. The majority of practical men will probably follow up this line of argument; therefore the man who follows milk-selling and butter-making will have to submit to one difficulty, which would not arise if his was solely a butter-making dairy. His cattle nor his system of feeding might not be so well adapted for one business as for another; but it can be safely asserted that, whatever his cattle may be, it will be found the best policy to feed liberally and well. This course will assuredly pay him in the long run. I have frequently heard from some of the best London milk-merchants—for there are men who are nothing else—that the milk from some particular farm is invariably good. The fact is recognised, records are kept of the quality, and these men always obtain either a preference over others, or they get higher prices when they are able to press the matter to an issue. Let us now take a summer price of 1*s.* the barn gallon, or say 6*d.* the imperial gallon, carriage having been paid, although this is

not the lowest, for there are plenty of men who only receive 5*d.* per gallon: 2¾ gallons of this milk,—we retain the figures for the sake of argument, although they would certainly not be exactly the same in both seasons—at 6*d.*, would return 1*s.* 4½*d.* If the butter were sold at 1*s.* the lb., and the skim-milk at 2*d.* as before, the return would be 1*s.* 5*d.*, showing a slight gain in favour of butter-making. But in this case the butter-maker has the advantage, he is able, by skilful making and by taking every means to make his wares known, to obtain a higher price. There need be no doubt about this; he certainly can if he tries and is willing to take the trouble. Again I speak generally, for there are districts in England where butter is, unfortunately, so low in price, that it can be purchased at 6*d.* per lb. during the most prolific months of the year. He may also be able to obtain a higher price for the skim-milk, but if it is consumed upon the farm—and it is doubtful whether the consuming price can be put at a higher figure than 1½*d.* per gallon—he will be a loser by the transaction, although some little value may be claimed on the part of the manure. Wolff, the great German chemist, in his tables showing the values of food stuffs, places skim-milk at 1·02 marks per centner, or about 1*d.* per gallon. The value of butter-milk is also very similar.

Is it possible to improve the returns from butter-making in any other direction than that which has been indicated? Assuming that considerable skill is exercised in churning and in manufacturing, and that the cows are liberally fed, there are at least two directions in which greater success may be attained. The first is in connection with the breed of the cow. There are many who are persuaded that the Jersey or the Guernsey are the best animals for this class of farm work; but farmers as a body have a distinct objection to extensively keeping a breed which cannot be marketed at will, and although I have bred Jerseys for some years and appreciate them highly as butter-makers, I am bound to admit that there is much in the argument. Old admirers of the breed tell us that we must not expect to obtain the profits at both ends, but this is exactly what the farmer expects to do, and he is quite justified in attempting it. Unless the owner of a herd has a great reputation, which few men can expect to have, he is obliged to sacrifice his bull calves at prices varying from half-a-crown to 7*s.* 6*d.* each, for they do not pay to keep, and although heifer calves and heifers when grown will realise remunerative prices, cows which from any cause it is necessary to sell are very difficult to dispose of except at a considerable loss. My own experience of Jerseys is that they are not large milkers, but that they are nevertheless excellent butter-makers, a fairly good

cow yielding 25 lbs. of milk daily for some months. This is not a large quantity, but, in my own case,—I have no other similar data to refer to,—20 lbs. of milk will yield 1 lb. of butter. For a considerable portion of the year such a cow would yield 8¾ lbs. of butter per week. At 1*s.* 6*d.* per lb., no butter being sold below this price in the winter, this would return 13*s.* 1½*d.*, but in addition, we have roughly 150 lbs. of skim-milk per week, some of which may be sold at one penny per quart, the remainder going to calves and pigs. I believe in a more populous district the bulk of this milk could easily be sold at the same price, whereas it would fetch ¾*d.* per quart throughout the winter in London. At 1*d.* a quart, one of these cows would thus return 9*s.* 1½*d.* a week during some winter months, as against a cost of 7*s.* 6*d.* to 8*s.* per week for food. We see therefore, after all, that the Jersey is a tolerably good paying beast. The following figures are taken from a record which the writer has been accustomed to keep for some years. The month of October will give a fair example of the quality of the milk in autumn.

	Cream percentage.	Butter percentage.
1886, October:—		
First week	14·34	5·23
Second „	12·9	4·5
Third „	12·3	4·7
Fourth „	13·9	4·6
Fifth „	16·1	5·05
1887, October:—		
First week	14·2	5·4
Second „	13·0	4·6
Third „	15·8	4·9
Fourth „	15·6	5·2
1888, October:—		
First week	14·3	3·52
Second „	12·1	3·5
Third „	12·3	3·78
Fourth „	11·3	4·0

This is by no means the best month. In the last week of December, 1888, the butter was 6 per cent. of the milk, and it was maintained at from 5 and 6 per cent. until May. In 1886, the quality remained very high until the second week in June, when it fell from 4·9 to 3·8. On the second week in May it rose to 6 per cent., and in the third week the cream was also the highest, 20·6 per cent. of the milk; while, strange to say, directly the milk fell in quantity, the cream did the same, dropping

down to 9·4, but it is worthy of remark that that very week the cake food was stopped. The cows are not all Jerseys, but usually include specimens of other breeds to the extent of about one third. In the island of Jersey, the exceptional value of the Jersey milk is paid for at a proportionately low price. A visit to the dairy of Mr. Griffin, at Trinity, during the month of September convinced me of this very fair practice. He pays from 7½*d.* to 8*d.* per imperial gallon, and finds that it requires from 20 to 22½ lbs. to make a pound of butter. This is really very creditable for purchased milk. It must be remembered, however, that there are no large herds in Jersey. Great numbers of small occupiers keep cows, but there are very few head upon each occupation. In contradistinction to this fact, I may quote the case of a friend who has a small herd of well-selected and very well-fed Shorthorns. He takes a great pride in his own dairy, and endeavours by every means in his power to secure a rich and plentiful supply of milk. Although the yield is good, the quality is but moderate, and 2¾ gallons are upon the average of the year required for each pound of butter. In this case, there being both skill and attention devoted to the work, the cows make as much butter or perhaps more than the Jerseys, and it realises as high a price in the market, whereas skim-milk is sent away at something like a penny per quart. I believe that the dairy, which is only a comparatively recent addition to the farm, is the best paying department upon it. The comparison of breeds invariably suggests what many people have come to regard as a fact, that the Shorthorn as a race is a producer of poor milk, and that the Jerseys and the Guernseys are producers of rich milk. That this is not an invariable rule is shown by the records of the milking trials of the British Dairy Farmers' Association. According to the Society's report, which was prepared by one of the Judges, Mr. G. F. Roumieu, M.A., the Shorthorns, in the eight years extending to 1886, showed an average of 3·69 of butter-fat; whereas in the year 1887, the fifteen cows competing gave an average of 3·89. In all, the mean of nine years, showing that 3·71 per cent. of fat, was obtained from 88 animals, very many of which gave considerably more than 4 per cent. of fat. At the last Dairy Show held in October, 1888, the prize cows and heifers—I refer to the five animals obtaining prizes, not for their richness, but for their general milking qualities—gave respectively, a percentage of fat, adding the milk of the morning and the evening together, of 3·66, 3·48, 4·17, 3·25 and 4·66; in one case the evening's milk reached 5·16, in another 4·81. Here again we have an average of 3·84 per cent. When we refer to the Jerseys, in order to compare

the quality of their milk with that of the Shorthorns, it is found that 75 animals have during the nine years given an average of 4·04 per cent. of butter-fat, which is ·33 per cent. more than that obtained by a still larger number of Shorthorns. These facts are a sufficient guarantee that Shorthorn milk of very high quality can be obtained if care is exercised in the selection of the cows, and that for a winter dairy we might expect a still higher percentage of quality than these figures show. In 1887, out of fifteen Shorthorn cattle there were four which gave 4½ to 6 per cent. of fat, one animal giving the latter amount both morning and evening. On the other hand it is fair to state that only one Jersey cow fell below 4 per cent. Although therefore, it will be admitted, that breed has much to do with the production of butter, yet we are also bound to accept the palpable fact that the cows of a particular breed, and especially of the Shorthorn breed, vary to a considerable extent in the quality of their milk, just as they do in the yield. It has now become an accepted fact that feeding is an important factor in connection with successful dairying. The following is a ration, which has been successfully given, showing the proportion of food constituents, arranged in accordance with the table of Wolff.

	Dry Matter.	Flesh-Formers.	Heat-Givers.	Fat.
lbs.				
7 Oat-chaff	5·72	·098	2·800	·049
7 Hay	5·88	·437	2·770	·084
3 Dried grains	2·58	·210	1·257	·234
2 Bran	1·61	·256	·854	·052
3 Cotton-cake	2·43	·930	·549	·369
14 Potatoes	3·50	·294	3·080	·028
	21·72	2·225	11·310	·816

This ration costs slightly more than 1*s*. per day, the potatoes having been purchased at 25*s*. per ton. For two months of the season 1½ lb. of linseed per day was given, together with an increase in bran, grains and straw, in order to compensate for the loss of the potatoes. The linseed was mixed with water in an iron tank, and steamed until the mass was almost like oil. The grains were steeped twenty-four hours before use, when it would have been almost difficult to distinguish them from fresh grains, while the remainder of the food was steamed together, the meal being mixed with the chaff. The cows which were milking the heaviest were given a somewhat larger quantity of this food than the others, but the whole were allowed to graze for some hours every day when the weather was favourable. I have

found in practice that linseed-cake, unless given in small quantities, is not an advantageous food to use in a butter dairy; and that cotton-cake, although it has an appreciable effect upon the yield, affects the flavour if given in large quantities. Turnips, which I have to some extent used every year, do not affect the quality of the butter if the crowns are removed, and the pulp steamed with the chaff, unless too large a quantity is given. Malt dust, bran, ground oats, mangolds and sweet silage, I believe to be among the best foods which can possibly be used, and whether or no the ration is of greater feeding value, I feel impressed with the fact that the cows relish the steamed food, which they get fragrant and warm in their mangers, much better than they do the food in its crude and raw state. Moreover, the steaming enables the feeder to use up inferior hay which the cows would probably refuse, and which might prove deleterious to them if given in its raw form. Warmth, again, is an undoubted element in connection with successful winter dairying. The Swiss have so much faith in this, that, as travellers and even those not at all interested in agricultural matters have noticed, they keep their cows in a very confined space with low ceilings, and as few apertures or windows as possible, in order that they may be perfectly warm. The body of the cow is robbed of much of its natural heat by exposure to cold. This causes an increased demand upon the food which the animal consumes, and which ought under ordinary circumstances to be applied by the animal economy to the manufacture of milk. When therefore we take precautions to keep cows warm, not forgetting to give them plenty of air, we are actually taking steps to save food, or to produce more milk. Writers who have recommended that cows should be groomed every day, have often caused a smile to appear upon the face of the farmer; but there is great reason in the suggestion, for warmth and vigour, and undoubtedly an agreeable feeling of comfort is imparted to the beast, which is also cleaned by the process. Thorough grooming causes an expenditure in time, but it is amply paid for, although the payment may not be immediately perceptible. One of the chief difficulties in keeping cows thoroughly clean arises from the non-employment of litter, or from its slight employment, especially when the cow-standings are long, and the animals, when lying down, soil themselves with their own manure. Unless this is removed on the following morning, and the hide cleaned, it will dry; and as the process is repeated, the filth will gradually accumulate until it becomes thoroughly matted, and will only fall off when the coat is shed. Every farmer appreciates this difficulty, whether among his cows or his fatting stock; but however much

he may desire to prevent it, he is often powerless on account o the carelessness or wilfulness of his men. Unfortunately thi occurs in the winter months when too many of us are in bed a the time when the milking takes place.

I will now refer to the other point to which reference has bee made, the skill that may be exercised in the dairy in order t obtain a large yield of butter. In this instance I refer more t the production of cream than of the butter from which it i ultimately obtained. Since the dairy fever has existed in ful force, a number of machines and implements have been place upon the market, all of which are claimed to possess the specia property of extracting practically the whole of the cream fron the milk. Some of them will not fail to do this in skilfu hands. With regard to others, it is not heresy to state tha success lies rather in the breach than in the observance of thei use. A farmer may, in a word, do better by retaining his old-fashioned utensils than in the adoption of some others of new type I confess to my belief that the separator is pre-eminently th utensil for the dairy. It is unnecessary to refer to any particula make, especially as there is more than one invention whicl is excellent. What machines the farmers should adopt is fo him to decide. He must look to perfection of work, simplicit of construction in view of possible breakages, and to the necessity of regular cleaning, to the power required, and to th primary cost. The best separators are all simple in construction do their work well, are easily cleaned, and are by no mean highly priced, the cost having been gradually reduced b increased competition among makers. At present it is possibl to buy a small separator which can be worked by a small boy or a large one which requires a powerful engine to work it. I believe that there are machines for hand-power which will d their duty well; but bearing in mind the relative prices of thes hand machines and small-power machines, I believe it to b false economy to purchase the former, wherever a farme possesses a steam-engine or can utilize one economically. A steam-engine, such as those made for dairy purposes by Hindle and others, should be upon every farm. It can be utilized fo chaffing, for pulping, grinding, steaming, churning, turning th butter-worker, and separating the cream from the milk. Thes machines, which do almost all but think, are labour-saving i the extreme, and with the addition of extra pulleys and belts a dairymaid can separate and at the same time churn her crean of the previous day, or work it upon the revolving butter-worker which rotates by its mere attachment to a shaft. Indeed, I hav seen instances, for the matter is not a difficult one, in which th whole work, including the stoking of the engine, has been per-

formed by one person. In another dairy owned by a personal friend, which is thoroughly well fitted up, the separating, the churning, and the work of extracting the moisture from the butter in the Delaiteuse, are all performed by a gas-engine. Here two persons are employed; but the engine, after being started and oiled, practically needs no attention whatever. We may assume then that the separator enables us to obtain all the cream that any known process will extract from milk. Dr. Babcock, an eminent expert in America, recently stated that in his country from 30 to 50 per cent. of butter is often lost by imperfect separation and bad churning. This is undoubtedly also true of our own country, for the dairymaid loses cream when she adopts the old system, and is unable to practise it successfully; while she also loses butter by a deficient knowledge of how to prepare the cream for churning, and in churning itself.

I will now refer, in as succinct a manner as possible, to a number of most valuable experiments which were made under the direction of Dr. Babcock, the chief chemist at the Wisconsin Experiment Station. The first experiment was made in the hope of obtaining some information with regard to the respective yields of butter churned from sweet and from ripened cream. The tests are believed to fairly represent what occurs in general practice. The cream used was obtained by the Cooley system, the milk having been submerged in iced water for twelve hours. Each lot was divided into two portions, the one churned sweet, and the other in its ripened condition. The churn used was of rectangular form, holding about 15 gallons, and the butter was brought in the grain and thoroughly washed with cold water, the excess of water being removed before weighing. There were eleven tests made, the cream varying in quantity from 226 to 243 ounces. The temperature at the beginning ranged from 59° in seven cases, and 61° in others, to 65° at the end of churning. The average time of churning the sweet cream was fifty-two minutes, that of churning the sour cream was twenty-nine minutes, while the average yield per 100 lbs. of sweet cream was 14·38 lbs., and from the sour cream 17·11 lbs. This is a tolerably convincing argument. The gain per cent. is given in five instances, the average being 18·98, and it will be admitted that this is of itself an extremely important item of knowledge to have obtained. I have repeatedly made experiments both with sweet milk and sweet cream, as opposed to ripened milk and cream. In the case of cream the advantage, without exception, has been in favour of the ripened cream, whereas with milk there has been no possible comparison between the yield obtained from sweet new milk and from milk which has been

actually coagulated. For instance, 30 lbs. of Jersey milk obtained from the cows in the evening, was churned forty hours afterwards during the month of May. After standing in a pail for twenty-four hours, half a pint of sour skim-milk was added. The milk when churned was a thick curd, and it produced 1¾ lbs. of butter. The temperature adopted was 66°, and the time occupied in churning was twenty-seven minutes. On another day during the same month, 34 lbs. of whole milk was churned at the same temperature. It was not quite new, but by no means sufficiently ripened for churning. This produced 11½ ounces, and when a test was made of the butter-milk, it was found to contain 1½ per cent. of fat. This is but a sample of many other experiments of the kind, which are simple in their way, and can be conducted by any person well acquainted with dairy work who is sufficiently careful to omit no necessary detail. In the American experiment Dr. Babcock made nine analyses of the butters to which reference has been made. He found in these butters an average of 16·11 per cent. of water, 83·25 per cent. of fat, and ·63 per cent. of solids, while the solids not fat averaged ·85. Thus we find sweet cream butter, although so much less in quantity, was poorer in quality. An important point, however, is in the comparative amounts of fat recovered from each 100 lbs. of cream, that obtained from the sweet cream being 11·69, as against 13·31 in the sour cream. There need be no surprise at this further proof of the profitable nature of churning ripened cream, for it has long been known, but it is quite as well that the matter should be conducted upon the basis of these very useful experiments. It should be observed that the temperature at which the sweet cream was churned was lower than that adopted for the sour cream. The tables which are published in the report show that the butter obtained by churning at 61° with sweet cream, averaged 79·20, while that obtained at a temperature of 59° was 80·88, per cent. a distinct and therefore valuable increase. Taking four typical instances of the sweet-cream churning, and three of the sour-cream churning, it is found that the average percentage of fat recovered in the churning was 79·79 from the sweet cream, and 91·64 from the sour cream. In both cases these figures point to a considerable loss of butter. In some experiments made in 1885, to ascertain how the fat of the milk was distributed in the process of butter-making, it was found that the skim-milk contained 12·48 lbs., the butter-milk 13·43, and the butter only 74·09. These figures point, first, to the absolute necessity of thorough skimming, and second, to perfect ripening and churning. For in every 100 lbs. of butter contained in the milk produced at the time of this experiment, it might be sup-

posed that $12\frac{1}{2}$ lbs. went away with the skim-milk, and nearly $13\frac{1}{4}$ lbs. with the butter-milk; a loss of 25 per cent. According to Martiny, by churning mixed milk, the loss, under the best conditions, amounts to from 5 to 10 per cent. This is not always attributable to bad management, for sometimes the cows are at fault, as in the following case. Three cows were tested, and in No. 1, 96·79 per cent. of the total fat was recovered in the churn, in No. 2, 99 per cent. was recovered, and in No. 3, only 79. In the last instance the cow was undoubtedly blamed. Another experiment was undertaken, in order to ascertain the effect of churning sweet and sour cream together, the practice being a common one to make large churnings, and to save labour. There were six churnings made, two each of sweet, sour, and mixed creams. The time occupied in churning averaged from fifteen to thirty minutes. The percentage recovered from the sweet creams average 80·38, from one of the sour creams 96·03—for I am unable to reconcile the increase in the second churning—and from the mixed cream 86·08. Dr. Babcock thinks that where creams are mixed from different milkings, they should be kept at a temperature of from 60° to 70°, and stirred twelve hours before churning, otherwise a portion of the butter-fat will be lost in the butter-milk. But, he adds, the most economical plan is when the cream from each churning is churned by itself. This is a most important statement, and may have the effect of causing some people to make these trials for themselves, and of adopting them if they find them advantageous, in spite of the additional labour they entail. Lastly, I may refer to a novel experiment, which was made by the addition of ·25 per cent. of lactic acid to the cream. It is well known that, when cream is exposed to the air, acid is developed, and that its presence up to a certain point denotes ripeness. Whether the presence of the acid is the cause of a larger yield of butter being obtained, has never, I believe, been absolutely determined, but the test now referred to is at least a step in that direction. The cream from one milking was divided into three portions, one of which was churned sweet, another being ripened by the addition of the acid, the third portion being churned when it had properly ripened, and when, in fact, it had developed lactic acid, similar to that which in a crude form had been added to the second lot. The three churnings resulted in 14·85 per cent. of butter from the fresh cream, in 17·19 per cent. from the lactic acid cream, and 18·94 from the ripened cream. It is noticeable that the ripened cream was more acid than that to which the lactic acid had been added. In an experiment made at the Royal Agricultural College, Cirencester, 15 lbs. of cream which had been obtained by separating, were divided into two lots,

and to each lot was added 8 lbs. of sweet separated milk. Lot 1 was churned sweet at 62°, while lot 2, to which lactic acid was added, was churned at 63°. The sweet cream only produced 2 lbs. 7¾ ounces of butter, while the acid cream produced 2 lbs. 11⅓ ounces. It should be added that the sweet cream was fifty-five minutes in churning; that the butter was gathered with difficulty, and was not worked upon the butter-worker in consequence; while the soured-cream butter gathered well, and was well worked, otherwise its weight would possibly have been greater. The odour of the lactic acid was distinctly perceptible in the butter made from the acid cream. In a similar experiment made at the Wisconsin College, in which an ounce of acetic acid was added to 16 lbs. of cream, the odour and flavour was imparted to the butter, but it was found, which was not the case with the lactic acid, to be entirely removed by washing when in granular form. With this acid 1·94 lbs. of butter was gained upon immediate churning, and upon churning in 1¾ hours, 2·34 per cent. was gained by ripened cream in the same experiment over fresh cream. In this series of experiments, too, it was found that cream which had been exposed to the air for twenty-four hours without ripening, yielded less butter than when it was churned immediately after skimming. This again indicates that the advantage which accrues from churning ripened cream is owing to the acid which is developed within it. If therefore the defects of flavour and odour can be overcome, and there seems to be little doubt about that, there appears to be no reason why successful churning may not take place immediately after skimming, by the addition of an acid. The last test was made to ascertain whether the size of the churn has any influence upon the quantity of butter yielded. Four lots of cream were churned in a 15-gallon rectangular churn. The quantities of cream used upon the same day were 256 ounces, 512, 768, and 1024 ounces, and in each instance the percentage of butter yielded was almost identical; but it happens that the time occupied in churning was exactly in proportion to the quantity of cream used. This it is extremely necessary to remember. The smallest quantity of cream occupied twenty-eight minutes, the next lot thirty-nine minutes, the third lot sixty-two minutes, and the largest and last churning eighty-five minutes. Here is another reason why a churn should never be filled too full, for it is evident that the last lot might have been divided into two lots, and butter brought in less time than was occupied in the one churning. Dr. Babcock's conclusions are that churning ripened cream results in a yield of from 15 to 20 per cent. more butter than is obtained from sweet cream, and that a similar increase in the yield of butter produced by

ripening cream may be obtained by the addition of an acid to the sweet cream just before churning.

According to Dr. Fleischmann, the celebrated German authority upon dairying, who did much good work in connection with the famous experiment station near Hildesheim, the following are the proportions of fat, water, and other constituents of salted and unsalted butter:—

	Not Salted.		Salted.	
	Unwashed.	Washed.	Unwashed.	Washed.
Water	14·22	15·26	12·00	12·50
Fat	84·00	83·59	84·54	84·50
Curdy matter	·80	·60	·65	·60
Sugar	·80	·40	·61	·40
Ash	·18	·15	2·20	2·00
	100·00	100·00	100·00	100·00

According to Dr. Bell, the Principal of the Somerset House Laboratory, butter varies in an extraordinary degree, and in a list of 113 analyses which he has quoted, I find the water varies in quantity from 4·15 to 20·75 per cent. It is needless to suggest how greatly the real value of such butter must differ. The percentage of curdy matter varied between ·24 and 5·32; while in some cases the actual fat was only about 75 per cent., and yet in others it exceeded 90 per cent., the majority being from 83 to 85. In one instance the proportion of water, salt, and curd, was so large, that there was actually 30 per cent. of material which was not fat. In this case the melting-point was higher than in any of the others. This butter contained 15 per cent. of salt, whereas the majority varied between 2 and 3 per cent. About 9 per cent. of these butters contained less than 10 per cent. of water. Surely this standard ought to be obtained oftener than it is. In showing the loss which occurs in butter-making, and in making cheese from skim-milk, Dr. Fleischmann says that he found 100 parts of milk made

Butter	3·31	Cream	17·09
Butter-milk	13·45		
Loss	·33		
Cheese	6·10	Skim-milk	82·24
Whey	74·14		
Loss	2·00		
Loss	·67	Loss	·67
	100·00		100·00

There are many persons who are especially fond of producing thick cream, not only for its consumption as such, but for the manufacture of butter. Upon the Devon principle this is, of course, a common plan, and it will be found easy under any circumstances, if heat is applied to the milk before the cream is removed. I remember a modification of the Devonshire plan, which is adopted in the dairy of Mr. Earle, of Edenhurst, Huyton, near Liverpool, which I was shown when inspecting his silo as one of the Judges of the Royal Agricultural Society. Mr. Earle has a penchant, which is not uncommon, for good thick cream upon his table, and he prefers it raw to that made upon the Devon plan. The cream was raised in a jacketed shallow pan, and, after a certain period had elapsed after setting, these pans were set over a lamp, or, if I am not mistaken, a jet of gas, especially arranged for the purpose, for a short time. Even in midwinter this caused the cream to assume a very delicate and thick consistence, and I am bound to say that it was one of the best samples that could possibly be tasted. There is one department in connection with a butter dairy which does not appear to have been generally studied so much as it might have been, although highly skilled persons may be occasionally met with who preserved their butter in this way with considerable success. Butter has been potted in my own dairy upon some occasions, and has been found perfectly sweet after a period of six months had elapsed, on other occasions it has lost its flavour in a third of this time. During the past winter from 50 to 60 lbs. of butter has been regularly sent to Egypt every week in glazed earthenware jars, with narrow mouths and lids, holding about 20 lbs. These jars were packed in boxes, being wedged in with straw, and are shipped at Liverpool, the journey from place to place taking about a fortnight. Two kinds of butter have been sent, one of which is made solely from Jersey cows, and samples in each case are retained, both of the butter in its unsalted form, and as it is packed for the journey. At the time when these remarks were written, almost every sample, extending for some ten weeks, was perfectly sweet. In each case the butter is prepared as for an experiment, in order that some information may be obtained at the end of the season from the reports which are in due course to be received. The salt is of the finest quality, being well dried and ground extremely fine. It is sprinkled upon the butter on a circular worker in different proportions, and in some instances mixed with a preservative which is not generally known, but which I have found to be of great value. When the jars are filled, the butter is smoothed and covered, in some instances with fine butter cloth, upon which a layer of dry salt is placed; but it is questionable

whether this is a really good plan, for the salt rapidly withdraws moisture from the butter, however well it may have been dried, and remains in an indifferent condition. In some cases one lot of butter has been retained for a day or two until the next churning, in order that both may be blended and salted together. The addition of the salt has caused the firm butter of the previous churning, which always appears to be extremely dry, to part with a considerable portion of its moisture: but there is no loss of weight on this account, the salt probably making up for the loss of water. The greatest care should be taken in potting or packing butter, whatever the utensil in which it is packed may be, to prevent any interstices or open places in any part of the mass. When a firkin is opened which has been filled for some days, or a basket of French butter which has been carefully packed in a cloth, these interstices will almost invariably be found, chiefly at the bottom, and at the sides near the bottom; just as the smooth surfaces of stale butter are discoloured and bad in flavour, so will the parts of the butter be found inferior wherever these interstices may be. There is not so much loss to the consumer who buys a large parcel, if this discoloration is confined to the surface, for it can be easily scraped off; but if the fault has extended to the interior, in consequence of bad packing, a large percentage of the mass may be rendered unsaleable, or at least it will be considerably reduced in value. In a less serious sense the same remarks apply to butter which has been potted in an earthenware vessel; at all events this is the result of my experience.

V.—*Notes on the Minutes of Evidence taken before the Commission on Agriculture and Dairy Schools.* By C. T. D. ACLAND, M.P.

ONE of the most remarkable effects of the period of depression which has passed over this country has been the stimulus imparted by it to the desire for technical education.

The first step taken by the Government in recognition of the need for instruction was a Commission of Enquiry into the condition of other countries in this respect, and the manner and extent in which the want is met abroad.

The portion of the Report of that Commission which referred to Agriculture, and which was prepared by the late Mr. Jenkins, Secretary of the Royal Agricultural Society of England, has been dealt with in a previous number of this 'Journal.'

It is no doubt to some extent in consequence of that enquiry that the Departmental Commission was constituted, before

which the evidence now under review was given. Of this Commission Sir R. H. Paget, a leading member of our Council, was appointed Chairman.

The Commission met on the 1st of November, 1887, and continued its sittings, which were eight in number, until the 8th of December of the same year. They examined forty-seven witnesses, among whose names will be found those of men well known to the agricultural world, both as eminent in practical farming, and as well qualified by experience to speak upon the subject of instruction in agriculture.

It is not proposed to discuss here the Report of the Commission, but rather to draw attention to some of the most valuable portions of the evidence contributed by the witnesses.

In order to enable our readers to derive some general impressions on each of the chief subjects which were dealt with, it will be probably convenient to deal with those subjects in succession, collecting under each head the most important answers of different witnesses.

The principal topics upon which questions were asked appear to have been as follows :—

I. The Need for Agricultural Education.
II. How such Education can best be provided.
III. The Combination of Scientific and Practical Instruction.
IV. The Instruction in Agriculture of Children in Elementary Schools.
V. The Training of Agricultural Instructors.
VI. Experimental Stations.

THE NEED FOR AGRICULTURAL EDUCATION.

Upon the first of these Mr. T. DUCKHAM, a well-known member of the Council of the Bath and West of England Society, who recently represented the county of Hereford in Parliament, appears to have been of the following opinion. He considers that

"farmers will be only too glad to let their sons leave home for a time to receive technical instruction, and that great benefit would be derived from the establishment of stations and schools for the benefit of farmers and labourers respectively."

The Rev. J. B. McCLELLAN, Principal of the Royal Agricultural College of Cirencester, states that

"a very small percentage of the pupils of that College are the sons of farmers."

A similar statement is made by Professor WRIGHTSON, of the Agricultural College of Downton.

Mr. GARRETT TAYLOR, practical farmer of 1000 acres in Norfolk, states that

"the present small farmers have no desire for technical education at all, but he thinks that they are becoming extinct, and will become extinct before agriculture can start on a healthy basis, and the new ones will require more technical education, which they cannot obtain without assistance. He therefore thinks that Agricultural Schools should in some way or other be created, and that it would answer the landowners' purpose to create them without a grant from Government, though it is not probable that they will do so."

Mr. T. CARROLL, Principal of the Glasnevin Schools, states, by way of illustrating the need for them, that

"a young woman who had been a pupil at that school told him that since she had been there, her father had received 50*l.* a year more, at his farm, from dairy-work."

Again, he states that

"the wages of these young women who have been trained at Dairy Schools have been quite doubled, they will get twice the wages of others."

Mr. T. MCCLELLAND, a farmer in Wigtonshire, expresses the following opinion :—

"There is a demand for three things: first, obtaining schools for teachers; secondly, the school for agriculture to which farmers could send their sons; and thirdly, an experimental farm for original experiments in agriculture under proper scientific supervision.

He does not think that either of these can be supplied by local effort.

Mr. W. C. YOUNG considers that there is a very large demand for a Dairy School, and says that

"he frequently receives applications from farmers who are anxious to send their daughters or their sons to some place where they could be made masters of the principles of dairy-work. He, therefore, advocated central institutions for the training of teachers."

Mr. G. BARHAM, Director of the Dairy Supply Company

"advocates the establishment of a central institute for dairy instruction, from which teachers might be sent to conduct schools at different farms. He thinks that the payment should be by results, rather than by a direct subvention from Government, and that such an institution would be attended by the children of the better class of agricultural labourers."

Mr. MORGAN JONES, a farmer living in the neighbourhood of Ludlow, thinks that

"if the endowed school of Ludlow had a farm attached to it, and could provide instruction in dairying and other branches of agriculture, and conduct experiments, the greater part of the farmers in the neighbourhood would send their sons to it, and pay a reasonable sum for instruction."

The opinion expressed by Mr. KIRKBY, also a farmer in Shropshire, that

"the existing Agricultural Schools are too expensive for the sons of farmers,"

is one that was shared by most of the witnesses to whom any question upon that subject was put, although it appeared to be the general opinion, also expressed by Mr. Kirkby, that

"the younger farmers of the present generation are fully alive to the advantage of scientific education in farming."

A steward named Mr. GEORGE BAYNES, of Essex, gives the following valuable answer:—

"I have children that I want to learn the work, and I want to learn also what I can, that they may gain a living by it afterwards; and I should like to see them able to improve themselves in that way; and if I send my children, I should like to send them merely for improvement. If there was a school for education in that department to learn people, there would be two classes of people to go. For instance, a man should know something about it, and see what there is to do, and learn it quickly; whereas a man who does not keep cows, because he has not got grass, perhaps would like his children to be learnt at that place, but they would have to be at it for longer than such as mine would."

Mr. JOHN SPEIR states that

"there is more room for teaching scientific farming in general farming, than in simply dairy farming;"

and he says that he has had

"a fairly good training in scientific and practical farming himself, and knows the enormous gain that it is to him, from the most minute operation of the farm to the purchase either of manures, feeding stuff, seeds, or any other thing."

He also states that

"the establishment of some lectures in the winter in the west of Scotland, assisted by landlords, in various ways attracted a very large number of the pupils."

This opinion is supported by Mr. MACMASTER, who thinks that

"if the Government could assist farmers in the way of schools, it would be the means of doing a great deal of good."

Professor WALLACE, of Edinburgh, bears witness to the success of a system established for agricultural instruction in Scotland.

Professor HOPE also, who had been employed by the Yorkshire Chamber of Agriculture as a lecturer, says that the farmers who attend his lectures appear to appreciate their value, and that it is especially the case with the best educated among them.

The opinions quoted above constitute a fair sample of the

mass of the evidence as to the necessity for giving special encouragement to agricultural instruction; and on that point the conclusion would appear to be, that there is among farmers of the present day a far greater appreciation of the advantages of scientific and technical training than would be found in that class fifteen or twenty years ago; while, on the other hand, the idea of special Agricultural Schools for sons of farmers is not supported.

The Commissioners, in their final Report, state that

"they have abundant evidence that among the younger generation of farmers there is a strong and growing desire for schools,"

but by schools they appear to mean especially Dairy Schools. And they say, that

"amongst the race of older farmers, smarting under the unpleasantness and difficulties with which they are beset, there is an increasing readiness to avail themselves of opportunities of instruction, provided that they are satisfied that the teacher is one who is not only competent to teach the principles of agriculture, but is also conversant with its practice."

It would appear from some of the answers already quoted that the desire recognised by the Commissioners "among the race of older farmers" for "opportunities of instruction" should not be considered to be confined to such opportunities for themselves, but, that there is a decidedly increased desire that instruction should be given to their sons, during school life, of such a nature as to adapt their minds for the reception of subsequent teaching specially directed to their profession. It is clear that nearly all the institutions which have been hitherto established with a view of giving special instruction in agriculture have proved too expensive for the class for which they were specially intended, or for some other reason have failed to obtain the general confidence of that class. It may not be out of place here to suggest, that there is perhaps room for regret that no system has been yet established to provide for the inspection of what may be generally termed middle-class schools. The local examinations conducted by the Universities may be said in some sense to replace this want, but the fact still remains, and it seems with regard to agriculture to be clearly established by the evidence to which we have referred, that there is a real necessity for vigorous action in the direction of effecting considerable improvement in our secondary instruction, and that, without giving to this instruction too special or technical a character, there are some steps still worth taking in most of the schools intended for the agricultural and commercial classes to adapt the minds of the boys and girls attending them for instruction of a more directly practical character.

II. and III.—HOW AGRICULTURAL EDUCATION CAN BE BEST PROVIDED.

The questions of how the instruction needed can be encouraged or provided, and whether a scientific and a practical instruction or training should be given simultaneously or separately, are so closely connected in the answers given by the witnesses, that although the subjects are distinct in themselves, it is almost impossible, without undue prolixity, to separate the opinions given by the witnesses.

Mr. DUCKHAM thinks that practical training must be given first, and on the farm.

Mr. GEORGE GIBBONS, practical dairy farmer, and a member of the Council of the Bath and West of England Society, expresses a strong opinion to the effect that

"it is better for children to learn the ordinary things that are taught in schools, and to receive their technical education afterwards, and is inclined to prefer practical instruction being given by practical men, rather than in established educational institutions."

Mr. R. JOHNSON, of Hollesley Bay, on the other hand, considers that

"the ideal agricultural education for a lad would be that he should have a thoroughly good general education up to the age of perhaps fifteen or sixteen, and then be sent to an Agricultural College for a couple of years before going to a farm."

Mr. NUTTALL, practical farmer in Leicestershire, thinks that

"night classes might give farmers an opportunity of learning the theoretical part of farming, while the practical part would be learnt by them at home on their farms, and does not attach much value to experimental farms as instruments of education."

Mr. MANSFIELD, a practical farmer, thinks that

"schools should take the shape of farms conducted by practical men rather than by scientific theorists, where people could be sent for a short time to learn how best to conduct any operation in farming. He considers that Cirencester and Downton are too expensive for the ordinary run of farmers."

Mr. H. T. MARSHALL considers it

"waste of time for a man who is going to farm to learn sufficient chemistry to render him competent to perform his own analyses, and he thinks a more elementary knowledge of chemistry is sufficient for any person engaged in agriculture. He had been a student at the Agricultural College at Cirencester. He is of opinion that young men should attend to the science first and learn practical application afterwards. He does not think that schools specially for farmers' sons would be attended."

There is, in fact, a general feeling amongst the witnesses that practical farming is best learnt at home, but that the science ought to be learnt at school. Most of the witnesses, however,

to whom any question was put upon the subject of itinerant lecturers, have spoken in favour of that method, or of a system of giving demonstrations, as, for instance, in dairy practice on different farms.

Professor WALLACE thinks that

"the offer of assistance from Government would tend to stimulate efforts on the part of farmers in different localities to establish and maintain schools where the kind of scientific instruction which is especially suited for agriculturists might be provided; but he shares the opinion, that, at present, at any rate the number of persons qualified by practical knowledge to give such instruction is very limited."

There are some witnesses, of whom Mr. VALENTINE, of Ludlow, is one, who think that practical instruction in the details of farming operations, and even of manual labour, could be usefully given at school; but these witnesses are in a small minority.

Mr. NEWLYN, Master of Sherborne Elementary School, expresses an opinion that

"the combination of theoretical with practical instruction is better than either given alone; but, for many boys, he thinks the practical teaching would be of greater value than theoretical, and he thinks that practical instruction in the garden, or on a farm, might be used to make school life more attractive."

Mr. GIBBONS, on the other hand,

"does not think that the time for which ordinary farmers can afford to send their children to school would admit of their learning much of the practice of agriculture in such a way as to be of much advantage to them. He is in favour of general education being given at school, and practice being acquired on the farm later."

Professor HOPE seems to be of opinion that

"a system of itinerant teachers giving lectures in different localities accessible from rural districts, would be the most effectual manner of providing the teaching required."

Mr. S. B. L. DRUCE, Secretary of the Central Farmers' Club,

"does not think that it is of much use to teach boys the theory of agriculture, but he thinks that farmers ought to learn it. He would press for Government assistance to reduce the fees of such institutions at Cirencester and Downton, for especial agricultural instruction, on the ground that, if boys are taught farming at ordinary schools, it would be to the loss of knowledge in other subjects; but that the fees at the establishments for especial technical instruction in agriculture are at present prohibitory,"

and this opinion is shared by nearly all the witnesses.

The Rev. Mr. GILLESPIE laid before the Commission a plan drawn up by the Committee of the Board of the Highland Society, which aimed at the establishment of an Agricultural College which would provide for a course of two years' instruction in theoretical and practical agriculture, and would

combine with that instruction the conduct of experimental work. But it was admitted that that scheme would entail considerable expense, and it would appear not to be very different from the institutions of Cirencester and Downton.

IV.—AGRICULTURAL INSTRUCTION IN ELEMENTARY SCHOOLS.

On the subject of giving instruction in agriculture to children in elementary schools, there is a good deal of difference of opinion among the witnesses. Mr. Duckham's opinion seems, on the whole, to be that a good deal may be done to improve the qualifications of agricultural labourers by instruction given during their schooldays, but he, like all the other witnesses, does not consider that teachers of elementary schools are at present sufficiently conversant with practical agriculture to be able to impart that instruction.

Mr. JOHNSON considers that the boys attending the country elementary schools can learn the practice of agriculture by the work on the farms, and does not think that children in elementary schools would be old enough to benefit by any special technical instruction; but Mr. McCLELLAN is of opinion that a good deal might be done for those children by means of evening classes and scholarships offered by the Government.

Mr. NUTTALL goes so far as to say, that he thinks that dairy education ought to be extended to Board Schools in the country, and this appears to be founded on the difference that he sees between the treatment of the children of artizans and the children of agricultural labourers, with reference to their preparation for their future vocations. At the same time he makes no practical suggestions of the way in which this proposal is to be carried out.

The answer given by S. T. MARSHALL on this subject is worth quoting at length:—

"What are your views with regard to the best manner in which agricultural instruction may be aided by the Government?"—"I think generally by giving the children of the agricultural labourers instruction upon subjects which would be likely to be useful to them in their occupations in life, principally, I should say, mechanics. I think they might also be taught something of geology, and something of the laws affecting animal and vegetable life, and anatomy of common farm animals, and of the simple steam-engine. I think that the instruction should be necessarily very elementary, but I think it would be of great use to them, because I think being upon a matter which would come constantly before them in their occupations, it would not be forgotten as is the instruction already given them pretty nearly as soon as they leave school in many cases. I think it might be done very much in an entertaining form, by having diagrams, hung upon the walls of the school, of mechanical appliances and anatomical diagrams, as the sheep or cow, and so on; and of the steam-engine." He adds, "I have always been told, when asking or

suggesting that elementary mechanics should be taught in the school, that mechanics was an extra subject, but that it was impossible for a schoolmaster to take it without running the risk of sacrificing a certain portion of the grant which of course the ratepayers cannot afford to lose. And, from looking at that list of subjects I became aware that the necessity for making English the first extra subject was a bar to mechanics being taken, or rather elementary instruction in class subjects." He subsequently expresses the opinion that "the master has not time to take elementary science without sacrifice, and that any instruction of a scientific nature given to the children must be very elementary." He thinks that "far more benefit would result from night schools held by properly-trained village schoolmasters."

Mr. G. TAYLOR says that

"a piece of ground ought to be attached to every school, and that it would be the greatest blessing to England at large if we had practical education given to both boys and girls." He thinks that "it would be easy enough to have a supply of milk for a school, and easy enough to have dairying taught there."

But he does not give any practical suggestion as to how it can be done.

Mr. CARROLL tells us that

"in Ireland, in all rural schools, agriculture is a compulsory subject for boys, and an optional subject for girls; he finds that girls get on the fastest. He says that land is attached to many of the elementary schools, generally rented by the teacher, and farmed at his risk and expense; but he found it necessary, as inspector, to strike many of these schools off the list, believing that they were not doing the work they ought to do. He says that fifty-six apparently are doing a fairly good work now. He thinks that garden schools may do a great deal of good in stimulating the cultivation of vegetables, and the introduction of new crops. The compulsory teaching of agriculture in Irish schools begins at the Fourth Standard, and includes boys from twelve up to sixteen. Probably there may be something for us to learn from the practice in Ireland in this respect."

Mr. CARROLL believes, however, that more good would be done by half-a-dozen well-organized institutions, than by the giving of grants to a large number of smaller ones, and he wishes to see the Agricultural Societies take up this idea.

A practical farmer, on the other hand, named Mr. G. COWAN, thinks that

"instruction in agriculture should, as a general rule, be made more complete in elementary schools,"

and therefore that

"if the Government were to give a grant, and in the National School in each parish teach the elements of chemistry and botany as established subjects, just as mathematics and German and other subjects are taught at present, it would be a good thing; and he thinks that the children of the agricultural labourers might by these means be induced to remain in agricultural pursuits."

But that opinion does not seem to be shared by many of the witnesses.

Professor TANNER thinks that

"elementary scientific teaching in agriculture, given to the children of agricultural labourers, tends to stimulate interest in the subject among the parents, and so may produce very good results; but that very much depends upon the teachers, of whom, at present, there is not an adequate supply."

The opinion of Mr. P. CUMIN, the Permanent Secretary of the Educational Department, appears to be that

"it is better to cultivate the general faculties of children at school, that they may use their faculties for their particular purpose when they come to do their particular work, and that the teaching of agriculture at elementary schools would be rather used as the means of earning an increased grant than be of any practical utility for the advancement of agriculture;"

and that

"it would not be expedient to teach science instead of any of the present elements of the education in public elementary schools. He does not believe that there is the means of teaching it, because the teachers do not exist. He believes, also, that the unfortunate little child of twelve years is so weighted with every possible subject, that he does not know where he is, because he has got reading, writing, arithmetic, drawing, music, English elementary science, every sort of thing, and the result is the Education Department is compelled to say, now, you may entertain yourself with all these various luxuries if you please; but if you wish that any public money is to be paid to begin with, you must lay a substantial foundation to the elements of reading, writing, arithmetic, drawing, sewing, and music. These are the most important subjects, we think, and, as far as the mere economy and reasonable security that the public do get something for their money, we adhere strongly to the principle of obligatory classes on specific subjects, and that they should follow in that order;"

and that

"scholarships might be given to children of elementary schools for the purpose of sending them to agricultural schools."

He agrees with Colonel Donnelly with regard to the introduction of agriculture in elementary schools that

"it would be necessary to make agriculture a subject taken throughout the school, whilst a great number or a certain proportion of the children in the school might probably not wish to follow agriculture as a profession afterwards;"

and he says that he

"formed the impression, as an Assistant Commissioner, in examining agricultural labourers and others, that what they want taught to their children at school is what they cannot teach them at home, namely, reading, writing, and arithmetic."

On the other hand, Mr. NEWLYN, at Sherborne, appears to have succeeded in an attempt to interest the children in the cultivation of ground attached to an elementary school, and says that

"the parents benefit by the produce of the school garden, so that the garden is self-supporting. He believed, however, that that instance is unique."

All his evidence on this subject, is interesting and important. But it is too long for quotation, and it would be impossible to give a complete idea of it by any extracts; but it appears that the position of that school commands unusual advantages, and the system carried on there could not be adapted to ordinary rural elementary schools without a very great increase of expense. The special feature of the school seems to be that each of about forty selected boys in the upper standards has an allotment rented at 2*s*., and consisting of three or four perches. They employ a paid gardener to give instruction, who has recently been receiving about 7*l*. for about half the year. None of the work is done during school hours. The produce belongs to the boy or his parents. Prizes are given for produce at the school, and have been won by the boys elsewhere. However, Mr. Newlyn says this plan cannot be continued without external help, and we therefore are almost inclined to agree with him in recommending that grants might be given for the purpose as a special, and, so to speak, an experimental attempt.

The Rev. J. P. FAUNTHORPE, Principal of Whitelands Training College for Schoolmistresses, thinks that,

"in the case of the children at the ordinary National School, of whom a large proportion of the girls become maidservants, and of the boys servants on farms, if they could be taught some of the theory of agricultural practice intelligently, and not theory only, they might be better able to help their mothers and fathers, because they would know something of the science of it; instead of going on by the rule-of-thumb in the ordinary way in which their fathers and grandfathers have done before them, they would have been taught the subject in a reasonable manner."

Miss SHEPPARD also thought that

"it would be a great advantage to stimulate interest of this kind among the teachers of rural schools."

Mr. S. B. L. DRUCE advocates

"not giving to the sons of labourers a special agricultural education, but teaching them the habits of ordinary animals, plants, and objects they meet with in every-day life, and with which they will be connected in their after life; and he thinks that the system of scholarships above alluded to would be an excellent plan."

Mr. BAYNES does not think much can be done at elementary schools, because children leave them so early.

V.—THE TRAINING OF AGRICULTURAL INSTRUCTORS.

We now approach the subject which appears to be the most difficult of all, namely, the provision of an adequate supply of agricultural instructors. It cannot be said that the evidence given before the Commission is very suggestive of means to this

end. It seems to be clear that the existing institutions for agricultural teaching are not especially devised or adapted for the training of agricultural instructors, nor, on the other hand, are the colleges at which teachers for elementary or other schools are trained provided with means for imparting the requisite knowledge of the practice as well as the theory which is necessary for any one who is to become a qualified teacher of the "Principles of Agriculture." And there is nothing more clear than that the ordinary agriculturist distrusts the power of any one who has not had practical experience in agriculture, to give him any very valuable instruction in its "Principles."

The Rev. J. B. McCLELLAN thinks that

> "it would be advisable that training colleges for country teachers should develop the teaching of agriculture, botany, or some other inductive science, and believes that it might easily be done."

Mr. RIGBY's opinion is

> "it would be invaluable that we should establish some institutions where teachers might be trained in especial departments of agriculture, such as the making of butter or of cheese, after the fashion of the school at Glasnevin, in Ireland. The difficulty at present appears to be, that the fees at the places of agricultural education are too high to admit the classes from which teachers might be derived."

Mr. H. J. MARSHALL suggests that

> "Cirencester might be used as a training college for teachers of elementary agriculture, elementary physics, elementary mechanics, and so forth. It would be an immense advantage that a training-school for teachers of dairy-work or other branches of agriculture should be established, so that teachers trained there might go about the country."

He thinks that at such an establishment

> "Professors of Agriculture" might come into contact with practical agriculture "sufficiently to prevent their falling into those mistakes to which men are liable, who only know it theoretically;"

and he believes that Government aid is absolutely necessary to carry out any such system.

Mr. T. CARROLL, in describing the Glasnevin Institution, says that he finds that

> "men who have passed through the Marlborough Street Training College, and have also had the opportunity of walking over the Glasnevin Farm, and taking an interest in the operations conducted there, and seeing all that was going on, make a much better examination than those teachers who have not had the opportunity."

Mr. McCLELLAND considers that the establishment of a central school for training teachers would be an excellent beginning, which might be further developed, and might provide itinerant teachers to go about the country. On the other hand, Mr. J.

SPIER thinks that if workers are properly trained, there will be no difficulty in getting teachers ; he would not advocate training men especially to be teachers. He says that

"the great fault of our teachers has been, that they have been what is called book-taught; what is really wanted is the scientific training of practical men."

Professor WALLACE thinks that if the younger generation of farmers were well trained, the best of them might rise to the position of teachers; but it requires especial qualities to be a really good teacher. In his opinion the teaching given by the Science and Art Departments has been injured by the system under which the prizes take the form of grants to the teachers rather than rewards to the students. He specifies two classes of teachers, both of which should be provided; one class for teaching in country districts in an elementary way; and another class, of much higher qualification, for teaching pupils of more advanced age. He says definitely, that

"it is only men of transcendent ability who can in after life acquire such a knowledge of agriculture as to entitle them to be placed in the list of good teachers. He thinks it is impossible to get a teacher with knowledge very limited, and at the same time accurate, and he is very doubtful whether we have at present persons properly qualified to train teachers of agriculture."

Mr. J. VALENTINE, of Ludlow, apparently would be satisfied with a lower standard, as his opinion is that there would be no difficulty in getting competent teachers. Professor TANNER, in his answers to questions put by Colonel Donnelly, seems to indicate the opinion that teachers of agriculture need not be supposed to be practical men, or intended to teach the practice of agriculture, though, of course, it would be of great value if they possessed practical knowledge; and therefore anything that contributed in that direction would greatly increase their value as teachers. He thinks that

"the best teachers we have are those who, having undergone a course of College instruction and taken their diplomas there, have afterwards gone down into the country and have been practically engaged in agriculture, and then for some reason or other become teachers instead of farmers."

At the same time, he thinks that we have not sufficient institutions, like Cirencester or Downton, to enable us to prepare quickly a sufficient supply of the class of teachers that is specially needed.

Professor JAMIESON thinks that the only way in which the teaching capacity of the teachers of elementary schools can be enlarged, is by their attending some central school where scientific investigation and demonstration are being conducted.

The Rev. J. P. FAUNTHORPE does not appear to think that

the practice of agriculture would be of any very great benefit to men who have to teach agriculture, but that if they could see certain things practised it might be of great service to them.

Colonel DONNELLY says that

"the Science and Art Department does not enter into the technical qualification of the teacher, but leaves that to the locality, on the grounds that the teacher of agriculture must be found on the spot, and that the demand for agricultural instruction has not been sufficiently high at present, to enable highly-instructed men to be employed."

That statement, taken together with the rest of his evidence, would appear to indicate that they make no pretension at South Kensington to provide trained teachers of agriculture. At the same time they no doubt do profess to pass teachers through courses in "Principles of Agriculture" with a view to their teaching them and thereby earning grants.

Mr. G. M. ALLENDER does not hesitate to say that

"there is not at the present moment in England a man who is entitled to the position held by most of the professors at institutions in Germany and Denmark,"

but he would urge that some men should be sent from England for the necessary training to some of the great agricultural establishments on the Continent.

The Rev. J. GILLESPIE says that

"the Board of the Highland Agricultural Society have come to the conclusion that 'there is no adequate means of teaching teachers to conduct normal teaching; there is no means provided in Scotland to teach the teachers of public schools, who are to earn grants under the elementary school system.' 'There is no adequate provision made for teaching the higher agricultural education.' A committee of the board of that society made the following recommendations, and the board adopted them:—(1.) That in their opinion this object would be best attained by the establishment of an Agricultural College, to which should be attached a farm of sufficient size to afford to the students a practical instruction in the various branches of agriculture, and to enable the society to conduct such experimental works that it may deem expedient. (2.) That the ordinary course of instruction should be for two years, and should be conducted by a resident member as teacher of the theory and practice of agriculture, and by non-resident lecturers on chemistry as applied to agriculture, botany and zoology, veterinary medicine and surgery, book-keeping and accounts, field engineering and mechanics. (3.) That the college and farm should be situated within easy reach of Edinburgh, in order that the non-resident lecturers might be able to attend without inconvenience and expense. (4.) That the students should be encouraged to engage themselves in the practical work of the farm as largely as possible without interfering with the courses of lectures. He also stated that he thought that any scheme such as that described above would not be sufficient unless those that conducted the scheme were bound to make a special provision for the teaching of teachers of the elementary schools, in normal schools or otherwise, in agricultural subjects."

The evidence given by Dr. Henry WEBB about the Agricultural School College at Aspatria, in Cumberland, is very inte-

resting, but it is impossible to quote it as fully as we should wish. The school seems to be fairly successful, and it is at any rate valuable for the reason, that it gives the opportunity for the conduct of experiments by scientific men in combination with the system of instruction for young men destined to be farmers. The conductors of that school appear to desire assistance to enable them both to extend their operations in experiments and to lower their fees. They have six farms attached, upon which the students are allowed to work and to receive instruction in the regular operations of the farm, such as ploughing, sowing, harvesting, &c. The students are divided into three sections—elementary, advanced, and practical. Dr. Webb expressed his opinion that it would be better if the general education were provided before the boys arrive at the school. Two answers given by him afford a very good illustration of the general question. He states :—

"We teach only the sciences that bear upon agriculture, but so many sciences do.

"We take chemistry, geology, botany, biology, physiology, theoretical mechanics, applied mechanics, and mathematics elementary."

VI.—Experimental Stations.

The next branch of the subject, that of Experimental Stations, is probably one of at least as much importance as any. It affords one of the most obvious methods in which assistance by means of public funds may be best given by the country at large to that branch of industry which justly claims to be the most important.

Much has already been done by the munificent and public-spirited liberality of Sir J. Lawes at Rothamsted, where the nation is indebted to him for a splendid endowment devoted solely to the promotion of science in application to agriculture. At Woburn, also, the Duke of Bedford has set a remarkable example by enabling the Royal Agricultural Society to carry on a connected series of experiments for the same purpose. There are also other instances on a smaller scale, and of less extended reputation, where landowners and Agricultural Societies have followed the lead given in the two above quoted well-known institutions.

There was no lack of evidence given by the witnesses before this Commission in support of the value of experiments in agriculture, both for the purpose of original investigation and discovery, and also for the entirely different purpose of educational illustration, whether intended for the preparation and scientific training of teachers, or to arrest the attention, to stimulate the observation, and to develop accuracy among the

younger learners. And for each of these purposes it is impossible to over-estimate the practical importance of experiment. Further, if we admit the expediency of the expenditure of public money for the exclusive benefit of one industry, it is in this direction that the claim of agriculture can most forcibly be urged. For it is impossible to carry on experiments with one eye kept on profit and the other on science. Either science or profit has to play the second part. That is to say, if, for instance, we try the effect of several manures, the result of the experiment, if anything is proved by it, must be that some manure is more profitable if applied under the special circumstances of the experiment than some other, and therefore, on the plots where the inferior specimen was applied, less profit, or more loss, will have resulted than on the others. Therefore the men whose livelihood depend on, among other things, profitable application of capital will be averse to risking a loss in this way.

Consequently Experimental Stations, if established, must be maintained for their special purpose and not for profit. Therefore they will require maintenance from without. But the question still remains whether this maintenance should be wholly, or partially, or not at all derived from public funds.

And here it may be well to express a doubt, which we do not find expressed by many, though it is by some of the witnesses, namely, as to the expediency of the establishment and maintenance *under Government* of a set of provincial institutions for agricultural experiment, in each of which an expensive, because highly qualified, staff will be required. There is great need for caution lest that should occur which was feared, not without cause, in the case of the old Universities, where what was called the Endowment of Research developed rapidly a taste for Research after Endowments.

It would seem that the best means of checking a too rapid increase of the appetite for the application of public money to Agricultural Experimental Stations might be found in a provision that in no case should such money be granted in excess of funds supplied from local sources. And although in municipalities with dense population the desire among both employers and employed for increased opportunities for technical instruction may, in the course of legislation, lead to power being given by Parliament to such municipalities to raise money by rates for such a purpose, we cannot, it may be safely predicted, expect that their example, if it be set in that way, would be followed by the rural or agricultural community. Consequently it will probably lie with the chief landowners or the supporters of local Agricultural Societies to meet the offer made by the

Government, if it be made, as is probable, subject to the above-mentioned provisions, in their several localities.

The opinion of those witnesses who entered most into this question is indicated by the following extracts.

Mr. WILLIAM MANFIELD urges the importance of the establishment of experimental stations, especially with regard to the action of artificial manures.

Professor WRIGHTSON does not approve of the conduct of original experiments by professors engaged in teaching. He thinks that the combination of these duties will be too much for one man, and that any experiment conducted at educational establishments should be limited to the purposes of illustration and instruction.

Mr. TURNER, a Scotch agent, does not think that grants are requisite for experimental farming, and does not believe in the value of experimental farms, unless they are under the supervision of local agricultural associations.

Mr. McLELLAND considers that it would be a great advantage that some experimental station should be established where original experiments in agriculture could be conducted under proper scientific supervision.

> "Very few farmers except in a rough way agree about going into much details of experiments; a few of them do so every year, but it cannot be said that they are carried out with any degree of accuracy, and much of the value of these experiments, such as it is, is lost for want of sufficient record."

He does not think that there is any chance of the establishment of such experimental stations by private effort alone, and would therefore advocate Government aid being given to encourage them.

Mr. J. SPIER disagrees with the proposal that had been made by one witness, that a school for instruction might also be made an experimental station. He does not think that the same man can conduct experiments and give instruction, partly for want of time, and partly for other reasons.

Professor WALLACE also advocates the establishment of experimental stations, and thinks that even in dairy farming something might be done by their means. He again considers that aid would be required on the grounds of the expense necessary, if they are to be conducted on a scale which would be worth having, but he considers that the development of agricultural education is far more important than the establishment of experimental stations.

Mr. T. BIGGAR is of opinion that 10,000*l.* a year is not more than would be required to put Scotland in as good a position as Holland, Germany, and Denmark, in reference to experimental stations.

Mr. COWAN, also a Scotchman, thinks that experiments in one part of England would not be much use to farms in another part of England, and therefore he lays stress on the importance of experimental farms being maintained in different districts.

Professor TANNER is inclined to combine instruction with original experiments, and thinks that purely scientific instruction might thus be supplemented by instruction in the practice as well.

Mr. LLOYD suggests

"that one central experimental institution might be used for teaching as well as experiment, and at each of them a travelling adviser might reside, to go, at the cost of the Government, to make inquiries and give advice wherever required."

He thinks that expenditure of this kind would be of great public value, on the ground that there is no science in which more progress is to be made than agriculture.

Professor LONG also is in favour of experimental stations, and would suggest that they might be devoted each to different branches of agriculture.

Professor JAMIESON, who has long been connected with a certain system of conducting experiments in the South of England as well as in Scotland, is of course in favour of the conduct of experiments at the expense of Government, and he goes so far as to say, that the need for establishments for this purpose must be entirely independent of local support, because local support cannot be reckoned upon for a sufficiently long period to make any investigation dependent upon it sufficiently complete to be worth the expense. He would advocate the combination of scientific instruction, practical teaching, and the conduct of experiments in the same establishment. It is not quite clear from his evidence whether the value that he attaches to experiments is for the sake of original research or as illustrative of teaching.

Mr. TISDALL wishes to see experiments in breeding carried on in connection with dairy farms.

Professor HOPE, who was himself an itinerant lecturer, thinks that experimental stations would be valuable as centres of instruction for lecturers.

Mr. DRUCE would like to see the Government take over some farms in different parts of the country, and turn them into experimental stations and centres of instruction.

Mr. GILLESPIE is anxious to see experimental stations started both for the purpose of answering problems in agriculture, and also with a view of being of service educationally to students who are attending lectures.

General Recapitulation.

The general impression derived from a careful examination of the evidence given before the Commission, from which the above extracts have been taken, seems to be as follows :—

General Education, Practice, and Science.

First of all, that there has arisen in the last few years a more keen sense among agriculturists of the value of the work of scientific men in connection with the various branches of agriculture; and, as the result of this, a vague desire that the rising generation of farmers may be enabled to benefit more directly from this work than their forefathers have done.

At the same time it is not clear that there is a decided predominance of opinion on the vexed question of the combination of practical teaching with scientific instruction. On the whole, the opinions of those witnesses whose words seem to carry most weight appear to be in favour of giving to the farmer's son, who intends to adopt his father's profession, a good general education during the first half, at any rate, of his school life.

No one could read through the evidence given by the witnesses called by the Commission without feeling that there is, nevertheless, a real desire for the provision, during school life, of sound teaching, though perhaps of necessity confined to the elements, of such sciences as bear directly on agriculture. At the same time the impression is produced by the general tone of the witnesses, that the farmer's son has plenty of opportunities on his father's farm for practical application of the scientific principles which he may learn at school.

Science in Elementary Schools.

With reference to the children of the labouring class, the opinion of those who were examined on that point seems to have been, that to those children, whose school life must of necessity be much shorter than the school life of the children of their employers, should be afforded more opportunity than they now have of apprehending some of the broadest and most elementary principles of science; and also of cultivating their powers of observation by means of the things surrounding them in their daily life. On this point the experience gained at the remarkable Institution at Sherborne is well worthy of notice, and may possibly form an example that might be followed with benefit in other parts of England.

Itinerant Teachers.

There seems to be a general opinion that much may be done to benefit farmers engaged in the conduct of their business by the provision of properly qualified itinerant lecturers on definite subjects connected with agriculture. For instance, in dairy practice undoubtedly much can be done by persons properly instructed in the theory and skilled in practice, who may go to the farmer's own dairy and there illustrate improvements in practice, and point out defects in the dairy arrangements or customs in the neighbourhood. And sufficient evidence was given by witnesses to make it perfectly clear that, for want of such instruction, a good deal of money is practically thrown away by farmers which might be saved by the adoption of practices in dairying, more in accordance with the well-ascertained laws of Nature. Although, perhaps, it can hardly be said that the evidence is as strong concerning other branches of agriculture, the enquiries of this Commission having been, to some extent, especially directed to dairying, it is probably not too much to say that there is much to be learnt by farmers of the present day, even in other branches of agriculture, from such itinerant lecturers, if only men can be found of sufficiently accurate and complete scientific knowledge, and without the ignorance of the practical details which too often renders well-trained scientific men unable to gain the confidence of the working farmer.

Need for Competent Instructors.

If one thing more than another has come out as the result of this Enquiry, it has been the urgent necessity for the provision of men properly equipped, both with scientific training and practical experience, and able to convince the farmer not only that he has much still to learn (which perhaps some farmers are already beginning to feel), but also that the teacher himself can give the farmer some really useful hints.

Experiments and Research.

There can be little doubt that if the expense be not so great as to frighten the Treasury, much may be done by the establishment of a few very carefully conducted systems of experiments; but the British public has a well-grounded fear of the multiplication of Government institutions and salaried officials, which dread may tend to hinder the establishment by Government of especial institutions for the purpose of agricultural experiments.

At the same time it is well to recollect that scientific experiment is only of real value if it be completely carried out, and recorded without the liability to modification which is almost inevitable, if the experiment is to be conducted as part of the process from which the occupier of the farm on which it is conducted is to derive his means of subsistence.

Relation of Government to Voluntary Associations.

This consideration points in the direction of combining Government assistance with local effort and control exercised by associations for the sake of the district in which the experiments are carried on. It must be borne in mind that there are two different purposes to which experiments may be devoted; one, and that perhaps the most valuable, is original research, and discovery or confirmation of scientific laws, in other words facts of nature; the other is for the illustration of scientific or practical teaching. The first of these may be said to be of national importance as affecting the whole of the agricultural interest; the second would rather be of local benefit as affecting a district in which any special branches of agriculture are being scientifically taught, with a view to the improvement of faulty but long-established habits.

VI.—*The Society's Dairy Schools; their Origin and Progress.* By THOS. F. PLOWMAN.

DURING the past year a development of the Society's operations has taken place which, if judged by the interest it has excited, and the attention it has received, will be entitled to a prominent position in the Society's annals. Although generally alluded to as a new departure, it may be more properly described as an onward movement in a path already partially trodden. For some years past a Working Dairy has been a conspicuous feature in the Society's Showyard, and one which has from year to year grown in extent and attractiveness. Lectures, explanatory demonstrations, competitive trials of workers and comparative tests of processes, have here been the means for conveying practical instruction. The results of the work done in it, as far as could be ascertained, were very encouraging, and it only needed the impetus given by the recommendations of a Parliamentary Commission and by the offer, for the first time, of a Government Grant in aid, to induce a further advance in the same direction. The fact that

the appointment of the Commission in question was due to the instigation of, and was presided over by, a Vice-President of the Society, who had manifested a keen interest in its work, was an additional incentive to the pursuance of an enterprising policy. The selection of Sir R. H. Paget as Chairman of so important a Parliamentary enquiry as that on Agricultural and Dairy Schools was referred to in congratulatory terms by the Society's Council in their Report to the Annual General Meeting of Members, held in the Showyard at Newport in June last. This may be regarded as the first step in the initiatory stage of the Society's Dairy Schools scheme, inasmuch as it afforded Sir T. D. Acland, Mr. Story-Maskelyne, M.P., and others an opportunity of pointing out the importance of the conclusions at which the Commission had arrived. This paved the way for a further recognition of the value of the labours of the Commission at the next Meeting of the Council in July, when a Special Committee, consisting of the President (Lord Clinton), Earl Amherst, the Right Hon. Sir T. D. Acland, Bart, Sir R. H. Paget, Bart., M.P., Mr. C. T. D. Acland, M.P., Mr. E. H. Llewellyn, M.P., Mr. N. Story-Maskelyne, M.P., the Hon. and Rev. J. T. Boscawen, Rev. J. Goring, Mr. G. Gibbons, Mr. J. E. Knollys, and Mr. M. J. Sutton, was appointed to consider the reports of the Commission with a view to ascertaining what assistance the Society could render in furthering some of its recommendations.

The Committee met shortly afterwards at the Society of Arts, London, and, having carefully considered how the Society's organization could best be utilised to forward the objects in view, sought an interview with the Lord President of the Privy Council at Whitehall. The Committee, who were courteously received by Lord Cranbrook, were introduced by Lord Clinton, who gave particulars of the Society's work, and explained how it could be further extended in the directions indicated in the Report of the Commission if some pecuniary assistance from Government were forthcoming. Detailed information with regard to particular departments having been furnished by other members of the Deputation, Viscount Cranbrook, expressed his appreciation of the Society's efforts, and pointed out how the Government could assist and be assisted in the promotion of the agricultural education of the kingdom.

A consideration of all the circumstances induced the Committee to conclude that the Society could best aid the objects in view by establishing migratory schools for the teaching of the best methods of butter-making in such districts as might desire them within the area over which the Society's operations extended. The Committee, in coming to this conclusion, were

strongly influenced by two considerations. Firstly, by the remarkable and increasing interest shown in all pertaining to the Working Dairy at the Society's recent Exhibitions, and the desire which had been expressed for a continuance, and an extension, of its advantages. Secondly, by an assurance from Mr. Story-Maskelyne, M.P., that the agriculturists of his district were ready and anxious to welcome such a scheme, and prepared at once to join heartily with the Society in opening a school at Swindon.

The scheme which, in the form of a Report, was submitted by the Committee to the August Meeting of Council, was unanimously adopted, and the standing orders were, by general consent, suspended, so as to allow of an immediate grant of 100*l.* being made towards the necessary expenses.

The following are the main points of the scheme as it was afterwards formulated and worked out in detail by a Sub-Committee, of which Sir R. H. Paget was Chairman:—

The Society will, with the assistance of Local Committees, organise the Schools, the general arrangements for which will be under the control of the Society.

The Society will provide skilled teachers and the necessary dairy appliances, and will afford instruction to students attending the School at the following rate of fees:—

	£	*s.*	*d.*
For Entire Course, extending over 10 days	1	1	0
„ One Week's Instruction	0	15	0
„ One Day's „	0	5	0

It is proposed that each School shall be kept open for at least three weeks, which will admit of two complete courses of instruction of 10 days each. Instruction will be given to students from 10.45 A.M. to 12.30 P.M., and from 1.30 to 4.30 P.M. every day (except Sundays).

Arrangements will be made, as far as the size of the building at the Society's disposal will permit, for the admittance, at a small charge, of persons who may desire to witness the operations without joining the classes.

The above are the conditions which apply especially to the Society; the following being those which Local Committees formed in the districts desiring instruction are asked, on their side, to carry out:—

1. To provide, free of cost to the Society, suitable premises (with a sufficient supply of pure water) for the School, including a room for a Working Dairy, not less than 30 ft. by 20 ft. in size, to be available for a fortnight, with the option of extending the term to three weeks, should the Society desire it.

2. To provide, free of cost to the Society, sufficient milk and cream for use in the Dairy, the produce of which will be handed over to the Local Committee.

3. To guarantee not less than ten students attending the entire course of instruction.

4. To secure the services of a Committee of ladies to assist in obtaining suitable lodging-accommodation for such of the female students as may require it, and, generally, to supervise arrangements in connection therewith.

As soon as the Society's intentions became known, an invitation to open a school at Swindon was received from a Local Committee, composed of landowners and farmers in the neighbourhood, and of which Mr. A. D. Hussey-Freke, of Hannington Hall, was Chairman. The invitation having been accepted, a suitable building, which had formerly been a tinned-meat factory, was fitted up for the purposes of the school, special accommodation being provided for spectators as well as students. The services of Miss N. Walsh and Miss E. Davey were secured as teachers. The former came from the Glasnevin School, Dublin, where she had most satisfactorily acquitted herself, and was strongly recommended by Professor Carroll, the Superintendent; while Miss Davey, who had been engaged at a Butter-factory at Bridgwater, had passed the British Dairy Farmers' Association examination, and had also distinguished herself in the Society's butter-making competitions at the Newport (Mon.) Meeting.

The Inaugural Meeting was held at Swindon on October 15, when an address on "Dairy Practice in the Making of Butter" was given, in kind compliance with the request of the Committee, in the Town Hall, by Professor McCracken, of the Royal Agricultural College, Cirencester. The chair was taken by Mr. Hussey-Freke, and there was a good attendance of the leading agriculturists of the district with their wives and daughters. Professor McCracken's address was of a thoroughly practical character, detailed particulars being given of the various operations, from the milking of the cow to the packing of the butter for the market. The reasons why certain methods were better than others were carefully explained, and a strict attention to the minute details of the art of butter-making was strongly enforced. On the motion of Mr. N. Story-Maskelyne, M.P., seconded by Mr. A. Goddard, a vote of thanks to the lecturer was carried by acclamation. After some remarks from Mr. G. Barham, and the Society's Secretary, a hearty vote of thanks, moved and seconded by tenant-farmers of the neighbourhood, was passed to Mr. Maskelyne for his successful efforts to induce the Society to launch its scheme at Swindon.

The school was opened on the following day, in the presence of many of the Local Committee and others. The attendance at each single course of instruction of ten days was limited to twelve students, that being as many as could be conveniently taught at one time. The full number, viz. one male and eleven female students, answered to the roll-call, and Mr. Maskelyne

then briefly addressed them on the objects and advantages of the schools. Mr. Gibbons having given some practical advice in relation to butter-making, the first course of instruction commenced. The morning work consisted of explanatory demonstrations on the part of the teachers, and in the afternoon the students reduced to practice, under the supervision of the teachers, the lessons that had been inculcated in the earlier portion of the day.

In a room adjoining the dairy proper, the various methods of raising cream were shown, and the students were also instructed in the testing of the quality of milk. The implements, which included steam-power and hand separators, were supplied by Mr. W. Hopkins, of Cricklade, who in another room of the building also exhibited an interesting collection of dairy utensils of the most recent type.

The second course was commenced on October 27, and was attended by two male and six female students for the entire term of ten days, and by eight others for shorter periods; making a total of twenty-eight for the two courses, whilst 194 spectators paid a shilling each for admission to watch the proceedings, exclusive of those who witnessed the competitions. The attendance of spectators, although by no means unsatisfactory, would no doubt have been larger had not the school been situated at some distance out of the town.

The Session terminated on November 15, when a prize butter-making competition was held among the students, for which eighteen of the latter entered. It took place in the Corn Exchange, Swindon, and attracted a large number of persons to witness it. Great interest was manifested in the proceedings, and after a very close contest, lasting from noon till 6 P.M., the Judge (Mr. G. Barham), awarded the prizes as follows:—

1st Prize, 2*l.* 2*s.*, Mrs. Hart, Basset Down Farm, Swindon.
2nd Prize, 1*l.* 11*s.* 6*d.*, Mr. L. A. Chaplin, South Marston, Swindon.
3rd Prize, 1*l.* 1*s.*, Mrs. Higgins, Stratton St. Margaret, Swindon.
4th Prize, 10*s.* 6*d.*, Miss E. Coleing, Upper Stratton, Swindon.

In addition to those named, three competitors were very highly commended, five were highly commended, and two were commended.

The prizes were publicly presented by Sir R. H. Paget, Bart., M.P., at the termination of the competition, and addresses were also delivered by Mr. N. Story-Maskelyne, M.P., Mr. G. Gibbons, and Mr. Barham, who, as Judge, drew attention to the high standard attained by the competitors generally, and to the evenly good quality of the butter they had produced; a result, he remarked, which was highly creditable both to the teachers and to the pupils.

Prizes were also given by Mr. Maskelyne for butter exhibited by non-students. For these there were eight entries, the first prize being awarded to Mrs. Rebbeck, of Shaw, Swindon, and the second to Mr. Herbert of Ewin, Cirencester, whilst others were honourably mentioned.

During the Session, Mr. E. A. Peel, from the Privy Council Office, made an official inspection of the school, and, after a very careful examination of its working, expressed a most favourable opinion both as to its educational value, and the particular mode in which the teaching was carried out.

It is gratifying to be able to record that the students were not slow to express their appreciation of the teaching power, and that ample evidence was forthcoming that the expectations of the local promoters of the school had been fully realised.

This feeling was emphasized at the next Meeting of the Society's Council by applications for membership being received from ten members of the Local Committee. The latter, on their part, fulfilled the conditions with a zeal and earnestness which did much to bring about a successful issue. They not only rendered every possible personal assistance, but were always ready to lend their men, their horses, and their carts, whenever they were required for cartage of water, &c., whilst as Honorary Local Secretary, Mr. J. A. Davis, of Swindon, never grudged either time or trouble for the good of the cause.

At the Meeting of the Society's Council on October 31, Sir R. H. Paget, as Chairman of the Agricultural Education Committee, officially reported the launching of the scheme, and the success which had attended it. Mr. J. D. Allen, of Evercreech, was added to the Committee, and votes of thanks were passed to those who had so heartily co-operated with the Society in promoting the School.

During the progress of the Swindon School, the Society accepted an invitation from the Committee of the Evercreech Agricultural Society to open a School at Shepton-Mallet; and, on the day following the termination of the Swindon Competition, the inaugural lecture, for which the Committee were indebted to Prof. Wrightson, President of the College of Agriculture, Downton, was given in the Music Hall at Shepton, the subject being "Dairy Management." Sir R. H. Paget, Bart., M.P., presided, and there was a very good attendance of the farmers of the district. Professor Wrightson prefaced his address by observing that he did not believe, notwithstanding all that had been said, that there was any better butter made in any quarter of the globe than there was in England. At the same time we made a great deal of bad butter, and the great point was to diminish this by spreading a knowledge of the best

methods of producing the best. He then proceeded to speak in detail of the leading principles of the art of butter-making, and gave particulars of some of the most recent improvements in the utensils, machinery, &c., employed, and pointed out how and why they achieved certain results. This he supplemented by statements of what his own experience had taught him with regard to them. The lecturer was thoroughly successful in securing the interest and attention of the audience, from whom he received a hearty vote of thanks, and the meeting concluded with some remarks as to the working of the school from the Society's Secretary.

The Shepton-Mallet School was formally opened by Sir R. H. Paget on November 12th, the premises formerly occupied by the Old Town Brewery, and kindly placed at the Society's disposal by Mr. Sherring, having been fitted up for the purpose. In the large instruction-room there was ample accommodation for spectators as well as students, and the walls were brightened by the addition of appropriate mottoes and bunting. Sir R. Paget, having addressed the students on the objects and advantages of the School, and emphasised the necessity of a strict attention to detail in all matters connected with butter-making, Mr. G. Gibbons pointed out that the position Danish butter had attained in the English market was due in a great measure to the fact that the Danish Government had realised the importance of spreading a knowledge of the best methods of butter-making. They had sent their young men over to England to learn, and on their return home had set them to work to teach their countrymen.

The full number, viz., three male and nine female students, had enrolled themselves for the first ten-days' course, and the procedure with regard to instruction was the same as that already described in connection with the Swindon School. A second course of ten days, attended by twelve female students, followed, and, more students being forthcoming, a third course was arranged, the Society taking upon itself some of the expense hitherto borne by the Local Committee, rather than disappoint any of those desirous of instruction. Eight female students attended the entire third course, and two for shorter periods; the total number taking advantage of an entire course at Shepton being thirty-two. Three hundred and forty-nine spectators paid one shilling each for admission, in addition to a large number on the Competition day.

On the completion of the last course, there were competitions of students for prizes given in equal proportion by the Society and the Local Committee.

The competitions were held in the Dairy School, and there

was no lack of interested spectators. Twenty-eight students competed, in two detachments. The first competition took place in the morning, when there were fifteen competitors, and resulted as follows:—

1st Prize, 2*l.* 2*s.*, Mrs. George, The Chantry, Frome.
2nd Prize, 1*l.* 11*s.* 6*d.*, Miss A. Rutherford, Farnham, Surrey.
3rd Prize, 1*l.* 1*s.*, Mr. L. Classey, Lottisham, Glastonbury.
4th Prize, 10*s.* 6*d.*, Miss E. Cannon, Milton Clevedon, Evercreech.

In addition, one of the competitors was very highly commended; one was highly commended; and nine were commended.

The second competition took place in the afternoon, when there were thirteen competitors, and resulted as follows:—

1st Prize, 2*l.* 2*s.*, Miss E. Candy, Walton Farm, Kilmersdon.
2nd Prize, 1*l.* 11*s.* 6*d.*, Miss E. Hellier, Burford, Shepton-Mallet.
3rd Prize, 1*l.* 1*s.*, Miss F. Beauchamp, Stratton House, Stratton-on-the-Fosse, Bath.
4th Prize, 10*s.* 6*d.*, Miss E. E. Fowler, Proud Cross Farm, East Harptree, Bristol.

One competitor was also very highly commended; and eight were commended.

The Judges were Mr. J. H. Bindon, of the Bath and Somerset Dairy Company (Limited), and Mr. H. J. Howse, of the London, Gloucester, and North Hants Dairy Company (Limited).

The prizes were publicly presented the same evening to the winners by Sir R. H. Paget, Bart., M.P. Addresses were also given by Mr. Geo. Gibbons, Mr. J. D. Allen, and others, and votes of thanks were passed to the Judges, the owner of the building who had kindly lent it for the school, and others. The Judges, in returning thanks, particularly alluded to the excellent and even quality of all the butter produced, and stated that so good was it throughout that they felt justified in commending the whole of the competitors.

During the progress of the school the Local Committee were, as at Swindon, most helpful, all concerned being especially indebted to the Hon. Local Secretary, Mr. R. Moody, of Cockmill, Pilton, who was indefatigable throughout.

Considerable assistance was also rendered by several implement firms, Mr. G. Hathaway, of Chippenham, having lent all the churns required, twenty in number; Messrs. Llewellin and Son, of Haverfordwest, the butter-workers; Messrs. Pond and Son, of Blandford, the tinned goods; Messrs. Thyss, Lockyer and Co., of London, the Jersey creamer; the Dairy Supply Co., Limited, the steam, hand and baby separators; and Mr. E. S. Hindley, of Bourton, an engine, boiler, &c., to work the steam-separator, and an engineer to attend to it. This school was also visited by

Mr. Peel, on behalf of the Privy Council, and he was again pleased to express his cordial approval of the teaching and general arrangements.

After a short interval, rendered necessary by Christmas intervening, the next school was opened at Chippenham. An introductory public meeting was held on Jan. 11, in the Town Hall, under the Chairmanship of Mr. Algernon Neeld, the Chairman of the Local Committee, when addresses were delivered by Mr. Gibbons and others. The school, which is now being conducted in the Corn Exchange and adjoining rooms, was opened on Jan. 14 in the presence of Earl Cowley, Lady Neeld, Rev. Canon Rich, Vicar of Chippenham, and several members of the Local Committee and others. Mr. A. J. Keary, Chairman of the Local Board of Health, presided, in the unavoidable absence of the Mayor, and warmly welcomed the advent of the school at Chippenham. The Society's Secretary having responded, the students were addressed by the Steward, Mr. Gibbons. Lady Neeld, at the request of the Committee, then formally declared the school to be opened, and expressed in graceful terms the pleasure she felt in being identified with so useful an undertaking. The school has been energetically taken up at Chippenham, three male and nine female students having entered for the first course, and two males and ten females for the second course, whilst the third is rapidly filling. The Local Committee have co-operated most cordially with the Society, and the carrying out of the general arrangements has been greatly facilitated by the valuable help of Mr. H. B. Napier, the Hon. Local Sec., to whom the visit of the school to Chippenham may be fairly said to have been mainly due. The Society is again indebted to the firms already mentioned for the loan of many necessary appliances. After Chippenham, the school will move on to Exeter, and applications are being received from other towns to share in its benefits.

In any scheme of education the quality of the teaching-power must be a most important factor in determining success or failure, and, in this respect, the Committee have, happily, been particularly fortunate. They succeeded in obtaining the services of two most competent teachers, who are not only able and painstaking, but whose manner and method have facilitated the acquisition of knowledge on the part of the students, and have at the same time rendered the intercourse between the teachers and the taught most pleasant to both.

In addition to the help rendered by the Local Committees, already referred to, the Society has received kindly aid and encouragement from many other quarters, and is especially indebted to those gentlemen who so kindly complied with the

Committee's request to deliver lectures or to act as Judges, all of whom gave their services without fee or reward, and came considerable distances to do so, in some cases at no little inconvenience. The implement manufacturers have, as has been seen, joined in promoting the work, and one firm, Messrs. Thyss, Lockyer and Co., has, in addition to other help, generously contributed 10*l.* to the Society's Dairy School Fund. The press, too, has shown its friendliness towards the movement by the publicity it has given to it, and by kindly references.

How much time and trouble have been devoted by the Chairman and other members of the Society's Committee, the preceding record sufficiently testifies, but this narrative would be singularly incomplete without a special reference to the enthusiastic labours of the Society's Dairy Steward, Mr. Geo. Gibbons, of Tunley, without whose practical experience and indomitable energy the movement never could have made the headway it has.

It is gratifying to all concerned that the course the Society has pursued has received the Governmental stamp of approval in the shape of a recent grant of 100*l.* from the Privy Council towards the work it is carrying out.

The schools will also receive a distinct recognition at the Society's forthcoming Exhibition at Exeter in June next, when there will be a special competition in butter-making confined to students who have attended the ten-days' course of instruction at any of the Society's schools.

It will have been seen from the particulars that have been given that a policy of mutual help is embodied in the Society's most recent development. By joining hands and making common cause with those who realise that improved methods more universally applied in this country are required to loosen the foreigner's grip on the butter-market, it has placed itself in touch with many in the outside world to whom the Society had previously been little more than a name.

January, 1889.

VII.—*Itinerant Dairy Instruction.*

It may be useful to add to the foregoing account of the Dairy Schools of the Society a short account of what has been done by private arrangement in paving the way for a systematic course by itinerant demonstration. Soon after the Newport Meeting a local gathering was arranged at Chedzoy and elsewhere in the Marsh district by Miss Winter, one of the competitors at

Newport, assisted by Miss Maidment. In consequence of the evident interest created by those meetings, Sir Thomas Acland obtained the services of Miss Maidment, daughter of a Somerset dairy farmer now farming at Closworth, near Sherborne, to give some demonstrations at the Home Farm, Killerton, to a class formed of the wives and daughters of the farmers of the district, and also before the Dairy Committee of the Devon Chamber of Agriculture, which has invited the Bath and West of England Society to open a Dairy School at Exeter. She is exceptionally well qualified to deal with the subject. She was commended for butter-making at the Bath and West of England Society's Show at Newport last year. She won prizes at the British Dairy Farmers' Show at Islington; at the Frome Cheese Show, and is a silver medallist of the West Somerset Agricultural Society.

At the first meeting Sir Thomas Acland began by saying that his object was not to find fault with Devonshire butter. The butter made on his farm by Mrs. Kelland, afterwards by Miss Giles, and now by Mrs. Quartly, had always obtained a good price in Exeter; but tastes are changing, and new methods are coming into use which it is necessary to turn to account.

Miss Maidment gave several demonstrations in the Killerton dairy and the immediate neighbourhood, besides visiting a number of farmhouses and dairies privately. She subsequently visited the following places: Thorverton, Holnicote in the Vale of Porlock, Winsford, Dulverton, Minehead, Dunster, Huntsham, South Molton, on the occasion of the Cattle Show, —when there was a very large attendance, thanks especially to Mr. White, formerly Mayor—High Bray, Landkey near Barnstaple; arrangements are now in progress for a visit to Holsworthy and Stratton, before Lady Day, when Miss Maidment will enter on her new duties at an important institution in Cheshire.

Some idea of the interest created by this itinerant instruction may be gathered from the fact that Miss Maidment has sold 164 thermometers, and 14 dozen pair of Scotch hands, thus improving the local art of butter-making without the immediate necessity for the purchase of expensive appliances. Accounts have been received from all the above-named places, testifying to the great local improvement in the butter of the several districts. Of course the advantage of practical work in the Dairy Schools of the Society during a regular course is very great, especially to young persons who desire to obtain a certificate of attendance and of competeney.

During Miss Maidment's stay at Killerton, some experiments were made and carefully recorded.

Nov. 14.—160 lbs. of milk were divided into 4 equal lots—and yielded as follows:

	Butter. lbs.	oz.
1. Put through the Baby Separator	1	12
2. Set on the Raw Cream system	1	4
3. Scalded on the usual Devonshire plan	1	7
4. Scalded immediately after milking	1	0

Nov. 19.—Two lots of 45 lbs. each.

1. Put through Separator	2	3
2. Scalded in the usual way	1	12

After the experiment on Nov. 14 the skim milk of No. 2 (raw cream) was scalded, and the cream which rose was churned, yielding the missing 8 oz.

The skim-milk from No. 1 (the Separator) was also scalded; but the stuff which rose after scalding, when churned, yielded no butter—proving apparently that the separator effectually took out all the butter-fat.

It may be noticed, however, that a small quantity of milk comes off with the cream, and in consequence there is much more butter-milk after separating than after scalding, but apparently that is not (at any rate in cold weather) any disadvantage, as it seems to assist the ripening of the cream and the churning of the butter; this, however, is a matter needing further enquiry.

Some samples were repeatedly collected, under Dr. Voelcker's instructions, of new milk, cream separated and scalded, and of skim-milk, from which no doubt we shall have further information.

Meanwhile Dr. Voelcker allows me here to state, that he has obtained the following roughly estimated results.

	1st.	2nd.
Scalded cream, percentage of nitrogen	·48 ..	·45
Separated cream „ „ „	·36 ..	·35
Scalded cream butter, percentage of curd ..	·46 ..	·58
Separated cream butter „ „ „ ..	·43 ..	·36

We may look forward with interest to the prospect of obtaining some accurate information as to the results of different systems of butter-making.

The following extracts from a report in an Exeter paper, omitting various personal and local details, will serve to illustrate the course taken subsequently at other places.

Miss Maidment demonstrated the making of butter from cream separated by means of the De Laval baby separator in accordance with the latest improvements; and Mrs. Quartly made butter by the old-fashioned plan of scalding the cream.

Each demonstrator was allowed fifteen gallons of milk, the weight of which was a little over 150 lbs. And *en passant*, it is as well to mention the great importance of weighing milk, rather than measuring it, a point which was incidentally referred to by Sir T. Acland. Miss Maidment explained that the most important point in churning was to stop immediately the butter comes or assumes granular form. Unless this is done it is impossible to extricate the butter milk. She then washed the butter in three waters, and placed it in a strong brine—made in the proportion of 2 lbs. of salt to eight quarts of water—where it was allowed to stand for four minutes. It was then placed on the butter-worker and the water gently pressed out of it. When it was thoroughly worked, the butter was broken, and the grain was distinctly shown, at the same time keeping "as close as wax."

Good Butter made from Devonshire Cream.

Miss Maidment then demonstrated how good butter can be made without the use of the churn or butter-worker, on the system in vogue in Devonshire, to which, she said, she lately had devoted some study. She showed that in this way it could be made quite as granulated as churned butter. She used scalded cream, and the only appliances were a pair of Scotch hands—which the uninitiated should be informed are two pieces of flat wood with handles—and an ordinary dairy tub. Stirring the cream with one of the Scotch hands until it assumed a granulated form, she washed it in brine, and made it up into pats, and it was found to be equal to that made by the butter-worker. None of the butter made by Miss Maidment was touched with the hands, so that a dairymaid with a cold hand is no longer such a valuable person as she is wont to be esteemed. The butter was weighed into pounds, half-pounds, and quarters oblong—a shape which is admirably adapted for packing purposes—with remarkable dexterity. An interesting point mentioned by Miss Maidment was that the best way to test butter is to snap it in halves. When so broken it should resemble a piece of cast-iron, every grain should separate, and it should be perfect in texture.

Answering questions addressed to her by members of the class, Miss Maidment said that the temperature of cream for churning in the winter should be 59 degrees, but on no account should warm water be mixed with it. To raise it to the right temperature a bottle of warm water should be "stood" in the cream, or it should be placed in a room where the thermometer stood at 60 degrees. In the summer the night before churning,

the cream should be stood in a large tub of cold, spring, salt water. There "were" three principal things to be observed in butter-making: temperature, cleanliness, and uniformity in quality and colour. The temperature of the dairy should be 55 degrees in summer, and 60 degrees in winter, and no dairy should be without a floating thermometer, which she preferred because it was made of glass, and therefore easily washed. There were several systems for raising cream which answered very well. The Devonshire system was one of the best, but it was impossible to deal with large quantities of milk in this way. The use of a separator, turned by steam, horse, or water power, was considered the best way for making cream in large dairies. And it should not be unnoticed that the same power which is used for driving the separator, could be utilized for turning the churn, butter-worker, &c., thus effecting a great saving of labour. The "baby separators" answered very well for small dairies, and could be worked by a boy. The great thing in butter-making was to preserve the butter in the finest granulated form, and when the granules were about the size of the heads of pins it should be washed in order to get out the caseine or curd which invariably turned butter sour. The reason why brine was used instead of dry-salting was this: Butter, dry-salted, required much more working, and therefore the grain was more likely to be destroyed. If the salt was not properly intermixed, the butter would be full of wet streaks and spots. The reason why the butter should not be touched by the hand was because the heat caused thereby would destroy the grain of the butter entirely, which was just what they wanted to prevent. Moreover, the hand was very injurious to the keeping qualities of the butter. If these few details were more generally attended to, there would not be a bit of bad butter in the United Kingdom.

Later on the baby separator—which, by the way, can be had for about 13*l*, a sum which places it within the reach of the majority of farmers—was worked by several of those who attended. A useful part of the fittings of the dairy is Varder's our-pan scalding apparatus. In the neighbourhood of Killer-on there are several large dairies, but most of the dairymen ire their cows.

In the wall of Sir Thomas Acland's dairy there are some aluable printed rules sanctioned by the Royal Agricultural Society, and they are so important that they should be in every dairy.* In effect they make known the necessity of washing all

* They are supplied from No. 12, Hanover Square, at the price of 1*d.*, or 5*s.* or a hundred.

dairy utensils in water, of using a thermometer, and of having the churn and cream at a temperature of 56 degrees in summer, and 60 degrees in winter. Churning should be at the rate of 40 to 45 revolutions per minute, and should be stopped immediately the butter comes. The butter should be washed in the churn with plenty of cold water; the churn should be turned two or three times very gently and the water drawn off, a process which is to be repeated until the water drawn off is quite clear and *free from butter-milk*. After "brining" and washing, the butter is placed into the butter-worker, which should be used until every drop of *water* is pressed out of the butter. There is a slight mistake in the printed rules; the butter-milk should all be removed by washing before the butter is put on the butter-worker. What the butter-worker removes should be only water. Attention to these simple rules cannot but have a wholesome effect, for there is no doubt that bad butter is due in the majority of cases either to carelessness or ignorance.

VIII.—*The Permanent Wheat and Barley Experiments in Stackyard Field, Woburn.* By Sir J. B. LAWES, Bart., Rothamsted, St. Albans.*

THE permanent wheat and barley experiments in Stackyard Field, Woburn, were commenced in the year 1877. In the Table on p. 96 will be found a summary of the results of the continuous growth of wheat and barley for ten years, 1877–1886. It also gives the highest and lowest yield in any one year; the mean of the highest and lowest years; the general mean of ten years; the weight per bushel of dressed corn; and the weight of straw.

Taking first the result of the wheat experiment, it will be seen how extraordinary is the influence of climate upon a crop which is treated in every respect in the same way year after year. On the unmanured plots we have three times as much produce in one year as we have in another. On the plot manured with nitrate of soda alone the produce in one year was 10½ bushels, and in another 41 bushels per acre; thus, one season in this case gives four times as large a crop as another. Differences so great prove conclusively the necessity of carrying on experiments without change for a number of years, as also the impossibility of drawing conclusions of any value from experi-

* Abridged from the 'Journal of the Royal Agricultural Society of England,' 2nd series, vol. xxiv.

EXPERIMENTS CONDUCTED YEAR AFTER YEAR ON THE SAME LAND, STACKYARD FIELD, WOBURN.

MEAN RESULTS FOR 10 YEARS, 1877–1886: QUANTITIES PER ACRE.

PLOT.	MANURES.	DRESSED GRAIN. Highest Yield.	Lowest Yield.	Mean of Highest and Lowest.	General Mean.	Weight per Bushel.	STRAW.
	WHEAT.						
		Bushels.	Bushels.	Bushels.	Bushels.	lbs.	cwts.
1	Unmanured	25·7	9·6	17·7	16·8	56·4	17⅝
7	Unmanured	26·6	7·5	17·1	17·4	56·3	17⅛
4	Mixed Mineral Manure	28·2	10·4	19·3	17·7	56·8	18¼
2	200 lbs. Ammonium-salts ..	40·3	11·5	25·9	25·4	56·5	24¾
3	275 lbs. Nitrate of Soda ..	41·0	10·5	25·8	24·1	54·8	25¼
5	Mixed Mineral Manure and 200 lbs. Amm.-salts (in spring)	46·1	13·0	29·6	31·5	57·8	32
6	Mixed Mineral Manure and 275 lbs. Nitrate of Soda (in spring)	45·2	14·0	29·6	32·4	57·8	34⅝
* 8*b* or	Mixed Mineral Manure and 400 lbs. Amm.-salts	48·8	27·0	37·9	38·8	58·2	42⅛
8*a*	Mixed Mineral Manure ..	32·5	13·3	22·9	‡20·4	‡58·6	‡17⅞
† 9*b* or	Mixed Mineral Manure and 550 lbs. Nitrate of Soda	51·0	26·1	38·6	37·2	57·8	44¼
9*a*	Mixed Mineral Manure	21·9	12·2	17·1	‡17·1	‡58·2	‡17⅛
	BARLEY.						
1	Unmanured	34·1	19·1	26·6	26·9	51·8	15⅝
7	Unmanured	33·3	13·0	23·2	23·0	51·0	13⅜
4	Mixed Mineral Manure	33·6	11·8	22·7	23·3	51·8	13½
2	200 lbs. Ammonium-salts ..	51·2	27·1	39·2	39·4	52·0	23⅛
3	275 lbs. Nitrate of Soda ..	51·6	21·5	36·6	40·4	51·7	25⅛
5	Mixed Mineral Manure and 200 lbs. Amm.-salts (in spring) ..	51·9	28·7	40·3	43·0	53·4	26⅛
6	Mixed Mineral Manure and 275 lbs. Nitrate of Soda (in spring)	57·8	27·3	42·6	46·0	53·0	30⅛
8*b* or	Mixed Mineral Manure and 400 lbs. Amm.-salts	62·5	30·8	46·7	51·2	52·9	33½
8*a*	Mixed Mineral Manure ..	46·4	26·5	36·5	‡37·0	‡53·6	‡21⅛
† 9*b* or	Mixed Mineral Manure and 500 lbs. Nitrate of Soda	66·8	37·0	51·9	53·3	52·4	38¼
9*a*	Mixed Mineral Manure	37·2	37·7	32·5	‡34·5	‡53·8	‡18¼

* Only one plot from 1877 to 1881 inclusive. In 1882 and since, it has been divided into "*a*" and "*b*" portions, and the Manures alternated each year. One half (8*a*) in that year (1882) received Mineral Manure alone, and the other half (8*b*) received 400 lbs. Ammonium-salts in addition (as applied to the full plot in previous years). In 1883, 8*a* received the Minerals and Ammonium-salts, and 8*b* the Minerals alone, and so on, alternating each year.

† The same plan adopted as for plot 8, with the exception that 550 lbs. Nitrate of Soda were applied instead of the 400 lbs. Ammonium-salts.

‡ Average of five years only, 1882–1886.

ments which, however carefully they may have been conducted, have only been carried on for one or two years.

In the fifth column of the Table is given the mean produce of the highest and lowest crops of the ten years, while the sixth column gives the mean of the whole ten crops. It is the latter column to which my remarks will apply. It may, however, be worth while to observe that the mean of the best and worst years frequently gives a produce which closely resembles the mean of the whole period.

Omitting 8*a* and 9*a*, which were only under experiment for five years, the mean of the other nine experiments gives products absolutely identical: that is, 26·8 bushels both for the mean of the highest and lowest product and the general mean. The two unmanured plots, in which the difference is very small, give a produce of rather more than 17 bushels per acre, while a manure which supplied all the mineral ingredients for a large crop has produced no appreciable difference. On the other hand, manures such as salts of ammonia and nitrate of soda, which supply nitrogen, but neither phosphoric acid nor potash, increase the yield by 6 or 7 bushels per acre. When the minerals used on plot four are added to the ammonia, or to the nitrate of soda in plots two and three, we find the produce raised to 31½ and 32½ bushels per acre. With the same mineral manures, but with twice the quantity of salts of ammonia and nitrate of soda, the plot which received the salts of ammonia yielded nearly 39 bushels per acre, and that which received nitrate of soda a little over 37 bushels per acre.

Speaking in general terms, the mineral manures have added nothing to the unmanured crop, while nitrogen as ammonia or as nitric acid, applied without minerals, has increased the crop by 7 bushels. When minerals have been used with the same nitrogen, another 7 bushels have been added to the crop, and when twice the amount of nitrogen has been used with the minerals, nearly 7 bushels more have been added to the crop. In all the experiments the weight per bushel of dressed grain is low, and this will generally be found to be the case wherever wheat is grown continuously on the same soil. In all of the experiments where nitrate of soda was used, the amount of straw is greater than where salts of ammonia were used.

Turning now to the barley, although the influence of season is still considerable, it will be seen that the fluctuations due to this cause are very much less than in the case of the wheat. This is the result of the barley being sown in the spring, and thus escaping the vicissitudes of the winter months. Further, the climate of Great Britain is far more suitable for the growth of barley than that of wheat, and to this may be added that the

soil of Stackyard Field is in its texture far more suitable for the growth of barley. For all these reasons it might be expected that the crops of barley, both the manured and the unmanured, would be superior to those of the wheat. From some cause, possibly some slight difference in the texture of the soil, the two unmanured plots differ considerably, one yielding close upon 27 bushels per acre and the other 23 bushels. As the plot which received the mixed mineral manures only gave 23 bushels per acre, it is probable that this produce more nearly represents the yield of the unmanured plot than the other. As in the case of the wheat, the mineral manure alone produces no increase in the yield of the crop. While, however, the addition of salts of ammonia and nitrate of soda added only 7 bushels to the produce of the wheat, these salts have added 16 and 17 bushels respectively to the barley crop. This large increase in barley over wheat by means of ammonia and nitrate alone is doubtless due to the difference in the character of the roots of the two plants. Wheat requires a solid bed, and its roots descend deep into the subsoil, while the barley requires a fine tilth, and its roots take much of the food near the surface.

It is the surface soil in Stackyard Field which contains a large amount of fertility. While, therefore, the application of ammonia or nitrate to the unmanured plots increases the crop by 16 to 17 bushels, the addition of minerals has only added to it, in one case 3½ bushels, and in the other case 6 bushels. Doubling the salts of ammonia adds 7 bushels to the crop, producing 51 bushels, while doubling the nitrate of soda also adds 7 bushels to the crop, producing 53·3 bushels per acre. In all these instances nitrate of soda has given a greater increase in the grain and straw of the barley crop than the salts of ammonia, whereas in the wheat the nitrate always gave the largest increase in the straw, but not so in the grain. A general examination of the wheat and barley experiments shows a remarkable agreement in the results, and, when they appear to differ, this difference may be explained by the different character of the two cereals.

It may appear at first sight strange that while the unmanured wheat only yielded 17 bushels per acre, the barley should yield 23 bushels; but if, instead of taking the bushel of grain as our measure, we take the total weight of the crops grown—straw and corn—we shall find very little difference in the weights. Wheat has a tendency to grow a larger proportion of straw to a given weight of grain than is the case with barley. If we take the highest yield of the two crops, in which the barley grew 16 bushels per acre more than the wheat, the total produce—corn and straw—in the wheat amounted to 7106 lbs. per acre,

while in the barley it was 7077. The manure has, therefore, done an equal amount of work in both cases, the same amount of dry matter has been produced, and the same amount of carbonic acid has been decomposed and carbon fixed in the plant. The only difference between them is, that, owing to the characteristic habits of each plant, one produces more straw in proportion to its grain than the other.

One of the important facts brought out with great clearness in these experiments is the absolute impossibility of increasing the growth of the cereal crops by mineral manures in the absence of available nitrogen in the soil; and it is tolerably well established that the nitrogen must be in the form of nitric acid. When, therefore, we use a salt of ammonia as a manure it requires to go through the process of nitrification in the soil before it is taken up by plants. Nitrogen as nitric acid being so valuable a substance as a manure for our corn crops, its economic application depends very much upon the price we pay for it and the amount of produce which can be obtained by its use. As the weights of the salts of ammonia and nitrate of soda used in these experiments are not those generally used in purchasing them in the market, it will make the matter more clear if the quantities used and the increase of crop obtained are calculated upon a basis of 112 lbs.

The increase of wheat by means of the mineral and ammonia salts over the mineral manures alone was 13·8 bushels, which was obtained by means of 200 lbs. of salts of ammonia, yielding 50 lbs. of ammonia. One cwt. of sulphate of ammonia yielding 27 lbs. of ammonia would have increased the crop by 7½ bushels. Using the same mode of calculation for nitrate of soda, we find that 1 cwt. would give an increase of 6 bushels. With barley we find that 1 cwt. of sulphate of ammonia gives an increase of 10½ bushels, while the same quantity of nitrate of soda gives an increase of 9 bushels. If these results could be obtained in ordinary practice a very considerable profit would be made. In regard to the application of nitrate of soda to barley, the increase would at the present time be obtained at a cost of not much more than one shilling per bushel.

That such an amount of increase is not obtained in ordinary farming is quite evident. This may be traced chiefly to two causes; first, to faulty application, the salts not being evenly distributed over the land; secondly (and this is, perhaps, the most important), to the amount of weeds in the land. Weeds feed greedily on nitric acid, robbing the corn of the food it would otherwise take up. It is true the nitric acid is not absolutely lost, as the ploughing down the weeds, and their eventual destruction under the soil, again furnishes nitric acid

at some future time; but the immediate effect is to render it necessary to use a larger amount of nitric acid to do the same amount of work.

Although the results obtained in Stackyard Field are much higher than can be obtained in ordinary practice, owing to the absolute freedom from weeds and the careful distribution of the manures, still there is a considerable difference between the amount of nitrogen applied in the manure and that which is taken up in the crop. If we take the mineral and nitrate manured barley, which shows an increase of more than 3000 lbs. in corn and straw per acre over the mineral manured plot, it is probable that not more than two-thirds of the nitrogen applied in the manure are to be found in the crop; and it is almost certain that in the ordinary practice of agriculture much less than one-half the nitrogen in the ammonia salts or nitrate of soda would be found in the crop to which it is applied.

The experiments in Stackyard Field throw some light upon the destination of some portion of this residue. For the last five years a portion of the wheat and barley which has received minerals and ammonia, or minerals and nitrate, one year, received the minerals alone the next year. On the wheat land, the minerals which followed the minerals and nitrate of the previous year show no increase of crop over the land which is always under mineral manures. Where salts of ammonia are used there is a gain of 2¾ bushels of grain per acre, but no gain in the straw. On the barley, the gain by the minerals where the nitrate was applied the previous year is 11 bushels and 2¾ cwt. of straw, while the gain from the previous application of salts of ammonia is nearly 14 bushels per acre and nearly 8 cwt. of straw.

All this is very interesting, and tells us that we must not be in too great a hurry to say that ammonia and nitrates are all exhausted by the first crop of corn to which they are applied. Here we have a very light soil, without vegetation from August in one year to the spring of the following year, holding a sufficient amount of a soluble salt to produce 11 and 14 bushels of barley per acre. How much more may exist in the soil to be available for other crops having longer lives and a more powerful arrangement of roots it is impossible to say. It is, however, evident that the subject is one of great interest, bearing as it does upon the value of unexhausted manures, &c., and must be one of many others which science has to take in hand.

In a lecture on root crops recently delivered by Dr. Gilbert at Cirencester, he pointed out that the use of nitrogenous manures was to increase the non-nitrogenous substances in our crops. He showed that in the field at Rothamsted which has

long been under root crops, we obtained about 20 lbs. increase of sugar in our mangels, for each pound of nitrogen which we applied in manure. In cereal grain, starch is found in the seed, and not sugar, but it is quite possible that a similar calculation would show that the increase of starch obtained by the application of one pound of nitrogen would not differ very much from that of the sugar in the mangels.

The very large increase in the wheat, and the still larger increase in the barley, by means of salts of ammonia and nitrate of soda alone, show how large must be the amount of mineral substances existing in the soil. We must not, however, infer from this that these crops remove the same amount of potash or phosphoric acid which is carried off by plants under ordinary circumstances. In some respects plants resemble man and animals: where food is abundant they take of the best, and sometimes more than they can make use of; where it is scarce or of inferior quality they do the best they can with it. In some of our barley experiments, where nitrogen, phosphoric acid and potash, and the same amount of nitrogen and phosphoric acid without potash, have been applied for a number of years, the crop has been nearly the same in both instances; but while the straw in one case contained 48 lbs. of potash, in the other it contained less than 7 lbs. Were it not for the economy of the plant, our soils, when constantly cropped without a sufficient supply of important manure ingredients, would be much sooner exhausted.

Although the large increase in wheat and barley obtained in the Woburn experiments by the application of salts of ammonia and nitrate of soda cannot be obtained in the ordinary practice of farming, still it is quite certain that, by more careful attention to the various circumstances necessary to insure success, a much larger yield of crop from a given quantity of manure is quite possible. Now that we have in several counties important experiments carried out under the superintendence of practical farmers, we may expect a much more rapid diffusion of knowledge in regard to the action of manures and cattle foods; and the connection between elaborate experiments carried out with everything necessary to insure accuracy and the careful but more practical experiments in the different counties will be found very close.

This short summary of the ten years' careful experiments in Stackyard Field cannot fail to add greatly to the knowledge of the value of manures, and to be a useful guide to those who are studying science in connection with practical agriculture.

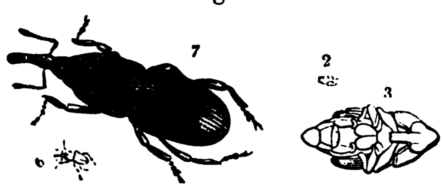
IX.—*Insects Injurious to Corn in Store.* By CHARLES WHITEHEAD, F.L.S., F.G.S., Agricultural Adviser to the Privy Council.*

THE three insects described in this Paper attack corn in granaries and warehouses, and not only hinder its germination, but materially lessen its weight and value. Their presence and their action upon corn of all descriptions are not uncommonly unsuspected, and the injuries occasioned in corn that has lain for some time unturned are frequently very serious, so that the vast importance of keeping granaries, and all places where corn is kept, clean, well and frequently brushed out, aired and cleansed, cannot be too strongly insisted upon. The first of these is known as—

THE CORN WEEVIL. *Calandra granaria.* Linn.

This insect, of the order *Coleoptera*, family *Curculionidæ*, and division *Rhyncophora*, does considerable damage to corn stored in granaries. The mischief caused by it is not apparent to the casual observer, but as the larva of the weevil concealed in the grain lives upon its substance, the valuable properties and weight of the corn are much diminished, and much loss is caused to farmers and corn merchants.

Fig. 1.



6, Perfect insect; 7, much mag.; 2, pupa; 3, much mag.

It attacks all kinds of corn, as well as malt. Foreign corn is frequently much infested with it, as it likes warm climates, and cannot live, or, at least, does not propagate, in low temperatures. In the Introduction to 'Entomology' it is said that "sometimes this insect becomes so infinitely numerous that a sensible man engaged in the brewing trade once told me, speaking perhaps rather hyperbolically, that they collected and destroyed them by bushels." It is well known in France and Germany, and has been found to be very injurious in America. Dr. Fitch

* Concluded from a Paper in a former volume of this 'Journal,' and printed with the sanction of the Agricultural Department of the Privy Council.

reports that it has been imported with Italian grain, also that it is very destructive to seeds in the collections of the New York State Agricultural Society. Mr. Cook, the chief executive horticultural officer of California, states that it a formidable pest in store-houses and mills in that country.

LIFE HISTORY.

This weevil is dark red, about the eighth of an inch in length, with six legs, and a very long beak or rostrum. It passes the winter in snug crannies and cracks in the floors and sides of granaries and warehouses, and comes out in the spring. Pairing takes place directly the weather is warm. The female gets into heaps of corn and deposits eggs in the grains, one egg in each grain. The larvæ, little white maggots, are hatched shortly, and eat the substance within the interior. The aperture made in the deposition of the egg is securely sealed up by some material supposed by Kirby, Curtis, and Taschenberg to be excrementitious. The pupa stage is assumed, and the weevils come from the grains when their contents have been pretty well cleared out, towards the close of the summer. Taschenberg holds that there are two broods in the season, but this has not been confirmed in this country. The weevils themselves may sometimes be found in the grains feeding upon their contents, as well as their larvæ.

PREVENTION.

The best means of prevention are to have granaries and store-rooms well brushed down with stiff brushes or brooms, and washed with soft soap and hot water. After a bad attack this should be done two or three times over, and the doors and windows left open all day and night, as the weevils are very susceptible to cold.

Corn lying in suspected places should be moved and turned over and over frequently when in heaps, at the approach of warm weather, in order to disturb the females in egg laying, and running it down through winnowing machines also prevents this.

REMEDIES.

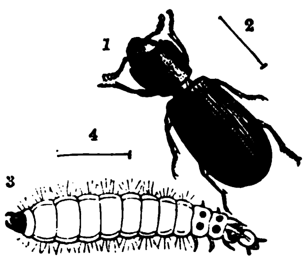
When it is discovered that corn is affected, or when weevils have been seen near corn-heaps, drying with hot air, at a temperature of 130 degrees, is efficacious, as the heat kills the weevils and their larvæ, but does not affect the quality of the grain or destroy its germinating power if the drying is conducted properly and the temperature gradually raised. Ventilation and the admission of cool air into places where corn is stored often have the effect of driving away the weevils. Long drain-pipes

put into heaps of corn cause circulation of air which is unpleasant to the intruders. Traps may be then set for them by putting grain in the corners of the granaries. Corn injured by this weevil may be easily detected by its lightness. To the unskilful no difference can be noted; but the experienced farmer, corn merchant, or miller will detect that something is wrong by taking up a handful and weighing it in his hand.

THE CORN BEETLE. *Trogosita mauritanica.* Linn.

This is another grain-boring insect, and belongs to the family *Tenebrionidæ.* Curtis says it was introduced from Africa, and that it is abundant in America, and in many European countries. In France it is called the Cadelle, and Olivier alludes to it as doing great harm to housed grain in the south of France. It is of the same family as the meal worm and the worm which eats

Fig. 2.



1, Perfect beetle, mag.; 2, nat. length; 3, larva, mag.; 4, nat. length of larva.

ship's biscuits. It is found in granaries and warehouses, and its larvæ sometimes greatly damage corn and other produce by biting the cuticle or skin, as it would seem in mere wanton mischief. At first sight it appears as if the corn lying in heaps had been nibbled by mice, but on close inspection the bran flakes are smaller, and bitten off differently. Sometimes when corn has been lying long, the quantity of bran which comes rom the heap is surprising.

LIFE HISTORY.

The weevil inhabits stores and warehouses among other places. It is about the third of an inch long, of a dark brown or chestnut colour, with six legs, and fairly sized wings. It is not known where the eggs are placed. The larvæ live in the corn heaps, in which they go from grain to grain, biting off the skin and consuming the flour. They are three-quarters of

an inch in length, of a white colour, having dark brown heads. Their bodies are covered with short hairs or bristles, and have twelve divisions or segments, with six thoracic feet. The jaws are strong, pointed, and horny, adapted especially for biting hard substances. At the beginning of autumn they bury themselves in dust, and in cracks of floors, and lie there until the early spring, when they assume the pupa form, and from thence soon come forth in beetle shape.

PREVENTION.

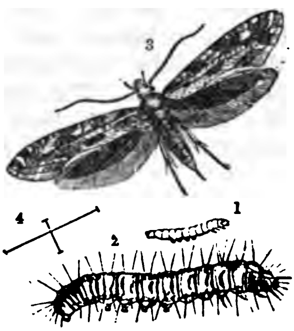
As this insect is most troublesome in foreign countries, particularly in hot climates, constant suspicion should be directed towards granaries and warehouses where foreign corn is stored. After the presence of these beetles has been detected, the floors and boardings all round should be scrubbed with water and strong solutions of soft soap well worked into the joints and cracks. All dust should be swept away and burnt, all ceilings whitewashed, and non-boarded sides must be washed with hot lime-wash.

REMEDIES.

When corn, English or foreign, is found to be infested with the *Trogosita* larvæ, it should be frequently moved, and winnowed occasionally. If this does not prove effectual, kiln-drying must be adopted to kill them.

THE CORN WOLF MOTH. *Tinea granella.* Linn.

Fig. 3.



1, Larva, nat. size; 2, larva, mag.; 3, moth, mag.; 4, nat. length.

This pretty little moth belongs to the family *Tineidæ* of the group *Tineina*, according to Mr. Stainton, the great authority

upon this division of *Lepidoptera*. It is called the wolf, and is so called because of its ravages to corn in granaries and storehouses, and is known in every part of the world. The manner of the injury done by the larvæ of this moth is much the same as that caused by the *Trogosita mauritanica*, only that it appears to consume much more of the grain. Its attack is often mistaken for that of the *Trogosita*. This moth belongs to the same genus as the clothes' moth and the fur moth.

LIFE HISTORY.

The moth appears first towards the middle of May, and is seen flying towards dark in granaries, and warehouses, not only of corn but also of other commodities. It is about three-sevenths of an inch across the wings, and its body is less than half an inch in length. It is of a dull white colour, with dark spots on the whitish wings. The female lays thirty or more eggs, yellowish, and so small that they cannot be seen without a glass. She places one or two upon single grains of corn—wheat, barley, oats, and rye. In the course of a fortnight tiny caterpillars with dark brown heads (No. 1) come forth and attack the grain with their stout jaws. They are of a light buff colour with reddish heads, having thirteen segments, and are close upon one-third of an inch in length. They fasten several grains together with a kind of web. Sometimes heaps of corn that have been undisturbed for some time are covered with these grey webs, which Curtis believes are for their protection. In Kirby and Spence's Introduction to 'Entomology' it is stated, "On visiting corn granaries at Bristol we found the barley lying on the floor covered with a gauze-like tissue formed of the five silken threads spun by the larvæ in traversing its surface." In due time the larvæ retire to chinks and holes in rafters, beams, and ceilings, and make cocoons covered with fine webs, and rest until the warmth of the spring sun tempts them forth. The larvæ of this moth are frequently found in the fissures of the bark of oak-trees and of 'uit-trees, from whence the perfect insects fly to the storehouses of grain.

PREVENTION.

. prevent the attacks of this destructive moth all rooms and ..ldings used for storing grain must be kept well and constantly ..., and the whole places—sides, ceilings, and floors—cleansed. t is said that the larvæ bore into wood to make resting-places .. neir transformation, it is important that all woodwork ..uld be scrubbed hard and well, so as to let the soap and water into every cranny. No lumps of dust or grain should

be allowed to remain in corners, or on the ledges or window-sills. Ceilings should be carefully and frequently whitewashed. Strong decoctions of quassia may be mixed advantageously with the soap and water used for cleansing.

REMEDIES.

When corn in store is found to be "moth-eaten," and webs are seen upon the heap, it must at once be moved, and frequently. If possible it should be run down through the winnowing-machine. Should the injury be great and evidently increasing, kiln-drying should be resorted to. Corn in sacks should be frequently examined, as the moth and larvæ work in sacks as well as in the heaps.

X.—*Milk as Food, and as a Poison.* By Professor BROWN, C.B., Agricultural Department of the Privy Council.

MILK AS FOOD.

NO product of animals used for food of man has been subjected to more critical observation than milk. The average consumer is not so much concerned about the quantities of fats and albumenoid and water in other kinds of food, and would probably be much surprised to learn that meat contains any water at all; but in regard to milk he is always interested in knowing that the percentage of cream is above the average, and that no water has been added. He also likes to be assured the milk is a perfect food, containing all the elements required for the sustenance of the body in any and all of the seven ages of man, from the first to the second childhood inclusive.

Milk, according to popular belief, is more or less nutritious, according to its richness, *i.e.*, the amount of fat which it contains. Skim-milk is held in low estimation, as poor stuff useful for the poor, who cannot afford to buy the highest quality; but in reality hardly worth the trouble of throwing to the pigs, except as a medium for diluting the more concentrated foods, and so contributing to the bulk of the wash. Chemists have always tried to teach people to avoid this very serious error, but without much effect, and consequently skim-milk, a valuable and nutritious food, is looked upon as refuse.

If the milk-consumer could be induced to read the following table, in which the constituents of milk are classified, he would find no difficulty in understanding the relative nutritive values of new milk and skim-milk.

Composition of Four Samples of New Milk.

	1	2	3	4
Water..	83·90	85·20	87·40	89·95
Butter	7·62	4·96	3·43	1·99
Casein	3·31	3·66	3·12	2·94
Milk Sugar	4·46	5·05	5·12	4·48
Mineral matter ash	·71	1·13	·93	·64
	100·00	100·00	100·00	100·00
Percentage of dry matter ..	16·70	14·80	12·60	10·05

The analyses were made by the late Dr. Voelcker, and are referred to by his son, Dr. John Voelcker, in his Lecture on Milk delivered at the Parke's Museum of Hygiene, April 24, 1884. Commenting on the composition of the different samples, the lecturer remarks that the samples 3 and 4 were the milk of cows belonging to the Cirencester College herd, and fed in September on a scanty supply of grass, and in November fed altogether indoors on cake, roots, and straw-chaff. The samples 1 and 2 were milks from a dairy in the neighbourhood. All the samples were perfectly genuine, and it is evident that a very great difference in the proportion of butter fats in milk direct from the cow may be expected under varied conditions of feeding and management, while the proportions of albumenoids and sugar are fairly constant.

The average 3 or 4 per cent. of fat in rich milk is good for fattening, and the man who eats and drinks—not to live, but to become portly—does well to insist on rich milk, with even added cream if he can get it, and has a digestive system which can dispose of it without upsetting the liver. But if muscle-forming food is desired, then obviously the milk which has the largest proportion of albumenoids is the one to be preferred, and it must also be evident that milk from which the greater part of the fat has been removed has a higher nutritive value than the richest unskimmed milk. Besides which, many delicate stomachs which would not tolerate much cream, accept the small proportion which is left in skim-milk, gratefully.

One objection only can be urged against the value of skim-milk for food. Under ordinary circumstances it is also stale milk. This objection is at once disposed of by the separator, by which the cream can be removed from the recently drawn, and therefore perfectly fresh milk, leaving a perfectly sweet, easily digested, muscle, and bone-forming food in the so-called "separated milk," which still contains all the really nutritive constituents and mineral matters, and enough fat to suit

bilious and dyspeptic subjects. "Separated milk" may not be a proper food for fattening swine, but it is certainly good for human beings, who require to be sustained rather than fattened.

It is curious, after all, that man of all animals should go on drinking milk all through his life. The habit is not based on imitation of the beast, because it is well known that the young of the mammalians cease to take milk when their digestive organs become accustomed to more substantial food. That milk is food for babes and other young creatures must have been evident enough in the daily life of a pastoral people. It may, however, be supposed that some degree of courage on the part of a grown man was necessary to induce him to return to the food of his infancy without any previous experience to guide him. But the first step taken, all would be easy. It would be found out that milk was pleasant to the taste, and easily digested, food well adapted for the feeble and the aged, as well as for the strong; and it may well be imagined that the cultivation of the milk-producing animal would soon be looked upon as a matter of surpassing importance, and the idea of drawing off the milk from the udder by the pressure of the fingers, instead of by the sucking action of the mouth of the young one, must have occurred to some ingenious person. This practice would lead to the further discovery that under the artificial system of milking, the secretion would not cease, as it naturally did when the young had ceased to require it, but continue for a long time under the constant stimulus of the milkers' hands.

By an easy process of thought the primitive man might have reached the conviction that milk was good for food, and having acquired a taste for the nutritious fluid, he, according to his custom, quietly appropriated it, and the animal which furnished it, and by artificial selection of breeding animals so far improved their milking qualities that a good cow can produce enough milk for a large family of calves instead of the one which is the ordinary result of gestation.

Dairy farmers of primitive times could not have collected and kept milk for food without soon becoming aware of the fact that the fluid is very unstable in its nature. Rising of the cream would be the first thing to be noticed, and it would not require much ingenuity on the part of the early milkman to enable him to take full advantage of this discovery. The change of sweet milk to sour must have taken the form of a calamity in the mind of the first man who observed it; the difficulty, if it existed, seems to have been soon adjusted, and it appears that the taste for sour milk was easily acquired, and it may be imagined that the solid curd of the sour milk would be removed from the liquid part, and used separately. By-and-

bye it was recognized that the hastening of this change by artificial means was desirable.

In early pastoral times the milk-producing animal lived under natural conditions, excepting the deficiency of water, which involved considerable hardship on the lives of a wandering people. In Eastern countries the ancient cow had some advantages which the modern animal lacks, and it is quite pertinent to the subject to inquire how far the dairyman of the present time has improved on the old system of managing the cow, which in primitive ages was left to manage itself.

Milk, as everybody knows, is a delicate compound, only to be kept pure by the most scrupulous attention to every detail which is included in the word cleanliness. Pure air, pure water, and pure food, are three of the essentials for the production of pure milk. It has only lately been fully realised that milk may be contaminated in the organism of the animal which secretes it. The fluid has to run the risk of a new set of adverse conditions after it is drawn from the udder, but it is worth while to consider the three requisites for a pure secretion to begin with.

Pure air must take the first place as the source of life and health to the living body. No doubt exists as to the necessity of air free from noxious things, which it is always so ready to take up and waft away. But it is not so clearly known that the lungs of the breathing animal are air-filters, removing from it germs of all kinds, so that the air which enters the lungs charged with microscopic organisms comes out again comparatively free from them. How many of the organisms so retained get into the milk cannot be known, nor is it possible to go beyond a mere speculation as to the effect of air-microbes on the stability of the milk.

Absolutely pure air cannot, of course, be provided for breathing animals, unless they all wore cotton wool respirators; but ordinary care would prevent the contamination of the atmosphere with putrescent germs, the presence of which is discovered by the sense of smell.

As a reason in favour of keeping dairy cows in the country instead of the town, it is always urged that the animals will have the benefit of purer air. The idea is poetical, but not practical, as travellers in, or travellers through, country dairy districts are aware. Even the open air breathed by the animal in the field is not always free from foul mixtures derived from putrefying animal or vegetable refuse. Cows in the country ought to be far better placed with reference to pure air than cows in towns, but the purest air is not proof against neglect of common precautions in sheds and pastures.

Pure water is not less necessary than pure air for the production of pure milk. Something like four-fifths of the fluid are water supplied from the blood-vessels, and although foul water taken into the stomach undergoes a great deal of filtering through fine membranes before it gets into the milk, there are some things which cannot be got rid of by the organism, excepting through the secreting organs, the udder doing its share of dirty work. It is a maxim among stock-owners that animals will often leave clean water to drink from a dirty pool. Of this tendency it can only be said that it should not be encouraged. The draught is not the less deleterious because the animal happens to like it.

Pure food is the third essential for the production of pure milk. It is not a question of quality or quantity, nor of the relation of the aliment to the constituents of milk, which is now to be considered, but solely the freedom of the food from any matters which will injuriously affect the milk.

The udder is peculiar among the glands which are concerned in nutritive processes, in its tendency to secrete along with the milk, matters which are foreign to its composition. Chemical agents are sometimes mingled with the milk, and the doctor is familiar with the fact that he can give medicine to the young one through the system of the mother.

Among the most familiar examples of the contamination of milk by the constituents of food, the effects of swedes and wild garlic may be referred to. The poisons of colchicum and lead have also been conveyed into the milk, and it is at least a fair assumption that any soluble mineral or vegetable poison may be thus excreted from the system of the milk-producing animal. These are patent illustrations about which there is no question, but evidence is not wanting of the existence of more subtle kinds of contamination. Dr. Toussaint, in the course of an inquiry as to the effects of the extensive use of grains on the milk of cows so fed, observed that infants could not digest the milk. Some of the specimens contained free acid, and all of them had an excess of water, and were therefore described as poor in quality; but neither the microscope nor chemical analysis revealed any changes which would account for the results observed. The stomach of the child was, in fact, the only perfect test of the milk, and Dr. Toussaint from his investigations arrived at the conclusion that milk cannot be considered perfectly good unless the stomach of the infant can digest it. The test is certainly a delicate one, and perhaps may be deemed a little too severe for the milk of common life.

When pure air, water, and food, have been secured, more than half the work remains to be done. To keep the milk pure after

it is drawn from the udder, is far more difficult than to provide for its secretion in a perfect state; only three things are necessary for the last, but the first demands endless care and attention. First, it must be noticed that the circumstances are unfavourable to begin with. The udder is placed in such a position that it is hardly possible to prevent it from being fouled with the excreta. The cow cannot lie down in the shed or the pasture without bringing the udder in contact with dirt. Then there is the dirt on the milker's hands and clothes. The filth of the cow-shed and the foul air are to be taken into account. In theory these difficulties are not insurmountable; in fact, in some model dairy farms they are surmounted day by day, but in the majority of cases there is not even an attempt to remove them.

Only the most simple means are wanted to secure the collection of milk in a state as pure as possible; merely an ordinary washing with warm water and soap if required. Washing, that is to say, applied to the cow's udder and teats and the milker's hands, the floor of the sheds and all soiled parts of the building, removal of manure and dirty litter, and provision for an abundant supply of air, and scalding or steaming of all milk vessels. Nothing more easy, it may be said; but the dairyman may be inclined to ask what does the washing of the udders of two or three hundred cows late at night or early in the morning mean in a large dairy, where everybody is in a hurry to get the milk into the churns and away to the railway station? To which the answer must be, that however troublesome, the cleansing processes are indispensable for the collection and distribution of milk in a pure state, and further, they are properly done in a few establishments, and might therefore be done in all.

Absolutely pure milk, collected in perfectly pure vessels, and sealed so as to prevent contact with air, will remain unaltered for a considerable time. But milk cannot for ordinary purposes be collected and stored in this way. The system, however, which is adopted in the best dairies, in which all the essential conditions are scrupulously observed, perfect cleanliness is insisted on, the health of the cows, and also of the milker, is strictly watched, milk is collected in vessels previously purified by boiling water or, still better, steam, and when collected is cooled before being sent out, includes all that can be reasonably demanded.

Even when all the conditions for ensuring the purity of milk are fulfilled, and the fluid is treated with the greatest care, it undergoes various changes, ending in putrefactive fermentation. In all these changes minute living organisms are the chief

agents, and recent researches lead to the conclusion that various forms of bacteria are concerned in the changes which determine the ripeness of cream, the flavour of butter, and the characteristic qualities which distinguish different kinds of cheese.

Micro-organisms in Milk.

Milk is, perhaps, more prone to changes than any other animal product. Left alone for a few hours, the fat, or at least a large portion of it, rises to the surface as cream. A little later the caseine separates and sinks to the bottom, leaving the transparent fluid, or whey, in which it was, together with the fat, held in solution or suspension. The whole mass has meanwhile become acid instead of alkaline, as it was when first drawn from the udder.

All the changes which take place in milk, excepting the mere rising of the cream, which is the necessary result of its lightness, are due to the action of certain ferments, most of which are living creatures of extreme minuteness known as bacteria: beings belonging to the plant world, which play a leading part in the processes of life and death. Nothing, indeed, which occurs in living or dead organic matter is quite independent of their aid, and most of the changes are altogether due to their influence.

To the question how do micro-organisms get into organic matter or into the living animal, there is a ready answer. Three of the four elements of the Ancients teem with them; earth, air, and water contain myriads of microscopic beings in a state of incessant activity. Perhaps fire is free from them, if so it is the one exception.

Some of the organisms which live in milk belong to the disease-producing kind, and are in every sense objectionable, as will be presently shown; but the majority effect changes which, if carefully watched and checked at the proper time, may be turned to useful purposes.

When cream is kept to ripen before being churned, the act of ripening is a stage of the fermentative process which is said to impart a nutty flavour to the butter not to be found when it is obtained from perfectly fresh sweet cream. The ripening may be carried too far, and the result is not always grateful to the fastidious taste. Preparation of cream for butter-making is an art which is capable of higher development than it has now reached, and it may hereafter be possible to determine at what exact stage of fermentative change the acme of ripeness and flavour has been secured. Until that point has been gained, it would certainly seem to be desirable not to allow the ripening to proceed quite so far as is generally permitted. It may

be true that cream may be churned when too fresh; it is also true that this mistake is one which butter-makers in this country very seldom commit, according to the general verdict of consumers.

The evidence which was before the recent Departmental Committee on Dairy Schools was almost unanimous on the subject of the shortcomings of butter and cheese-makers in this Kingdom, and the great superiority of foreign methods. A general neglect of what may be called the science of dairying may account for this deficiency. Science, however, was not in favour with some of the most practical and experienced of the witnesses, who, in reply to the question whether they would be disposed to send their sons to a dairy school, stated that they would be very much surprised if the boys could be taught anything more at such schools than they could learn at home. And this was said with a full realisation of the fact that cheese made under exactly similar conditions was sometimes of good and at other times of bad quality, and no one can tell why—because no one knows, and, under present circumstances, no one is encouraged to try to find out; nevertheless the subject is a promising one.

"Microbes in milk" may be taken as the title of a new departure in science, which MM. Pasteur, Duclaux, and a few others, have just entered upon—only to an extent sufficient to indicate what may be expected from further investigation.

It is not necessary for the purpose of this paper that the micro-organisms which have been found in milk should be described in detail, but it is worth while to enumerate them and refer to their action.

That all the ordinary changes which occur in milk are due to the presence of micro-organisms has been proved to demonstration. Lactic acid fermentation is due to the action of the lactic acid bacillus on milk sugar. The proof of this fact presents no difficulty; it is only necessary to cultivate the organism on gelatine plates until it is quite free from other organisms, and then use it to inoculate sterilised milk, in order to show that the setting up of the lactic acid fermentation is the result of the introduction of the bacillus. In the same way precisely the action of the microbe which causes butyric acid fermentation may be illustrated, and also the action of the organism which is concerned in the production of ropy milk.

The value of milk as an article of food is generally diminished by the occurrence of fermentation, and it is therefore desirable to consume it before the action takes place. In respect of the products of milk—butter probably, and cheese certainly—the results obtained by the manufacturer are entirely dependent

on fermentation. It is allowed that there is much yet to be learned about the microbes of milk. It may be affirmed that still less is known of the action of organisms in butter and cheese. M. Duclaux, in his work, 'Le Lait,' points out that microbes exercise a remarkable influence on the fats of butter and cheese, and shows that the special characters of *cantal* and other cheeses are due to the peculiar kind of fermentation, which is the result of the action of micro-organisms. It is asserted that in certain districts the microbes concerned in the production of special kinds of cheese are always present, and in their absence the particular cheese cannot be produced.

The investigations which have been made in reference to the making and storing of cheese open a vast field for the work of the bacteriologist and the chemist. Butter and cheese makers who have long practised their art with a certain amount of success, may decline to give up their faith in the rule of thumb, but the rising generation must pay some respect to modern methods if they intend to keep up the pace in the commercial race in which they have to compete with the whole world.

MILK AS A POISON.

Organs which are engaged in secreting certain fluids from the blood with which they are supplied, must possess a power of selection to enable them to separate the materials required, and reject others. Secretions are not carried to a gland ready made, and in a state to be at once poured off, but it is the particular function of the gland to construct the secretion out of the constituents of the circulating fluid.

The function of the mammary gland is to separate from the blood the elements of milk. In the exercise of its function, however, the gland frequently removes from the blood substances which are not proper to milk, and some which render it unwholesome, or even poisonous. Medicines given to the mother affect the sucking young; active principles of poisonous plants are carried out of the circulation in the milk, and cause disease in those who drink it. Milk, therefore, may become poisonous from the excretion of poisonous substances introduced into the system of the animal which produces it. Further, as has been explained in the remarks on milk as food, the fluid, as it is collected under ordinary conditions, contains chemical ferments and living organisms, which effect changes in its composition, and modify its value as an article of diet.

What amount of injury to the consumer may result from the products of fermentation in milk is not known, cannot, indeed, be guessed at in the absence of experimental evidence;

but the few facts that have been noted by observers are of importance. Many years ago the late Dr. Voelcker, while conducting some experiments in cheese-making in the laboratory of the Royal Agricultural College, Cirencester, discovered, by an accidental test, that cheese during a certain stage of fermentation became poisonous. Dr. Voelcker ate a small portion of one of the experimental cheeses, and was shortly afterwards seized with vertigo and nausea, followed by vomiting. The experiments did not end here. The sufferer, in order to place the matter beyond doubt, at once gave a little of the cheese to one of the laboratory assistants, and the same effects followed. The zeal in the cause of science thus shown by his late colleague at Cirencester, made an impression on the writer's mind not likely to be effaced.

At the time when Dr. Voelcker performed the impromptu experiment above referred to, little was known of the life history of microbes, and fermentation was considered to be a chemical instead of a vital process. Now it is quite well understood that among the results of the various kinds of fermentation induced by living micro-organisms, is the production of ptomaines, alkaloids, and extractive matters, most of which possess deleterious, and some of them deadly, properties.

Only by their effects can the presence of the products of microbic action be proved, the poisons produced have not been isolated, and together they form a mysterious group of compounds, offering unlimited opportunity for research, of which no experts have yet taken full advantage.

Bacteriologists have of late made great advances in the knowledge of the structure and habits of micro-organisms, and it may, at least for the present, be affirmed that these minute creatures belong to the plant world, and that some of them cause specific diseases, while others induce fermentation, ending in putrescence. In the attempt to explain the action of microbes, numerous theories have been advanced, but the view which ascribes the effects to the production of certain poisonous compounds (ptomaines), is the one least open to objection. This view was shadowed forth by Hillier in 1877, in his famous experiment on putrefactive organisms. Hillier obtained from putrescent fluids by filtration a large number of bacteria, which he washed repeatedly with distilled water; and having so cleansed them, he diffused them in distilled water, and injected them into the blood-vessels of animals, and finally into his own blood-vessels. It was known that a drop of the septic fluid from which the bacteria were obtained would kill an animal in a few hours. But no harm resulted from the injection of the washed bacteria, and the inference

naturally drawn by Hillier was that the deadly properties of septic fluids did not reside in the micro-organisms themselves, but in the products of the processes which they set up. Advocates of the theory of the deadly powers of bacteria promptly alleged that the washings with distilled water had killed the organisms, a criticism which Hillier met by proving that the washed bacteria soon became as active as ever when placed in a favourable culture medium.

Milk is an excellent culture medium.—This statement is common-place enough to the mind of the scientist. It is emphasised here in the hope that it may impress the mind of the general reader; because until the fact is quite clearly accepted, and its consequences looked at from a common-sense point of view, the importance of keeping this culture medium free from septic and disease-producing germs cannot be sufficiently realised. Absolute freedom from contamination cannot be secured; but if dairymen could be made to understand that myriads of invisible but terribly real and noxious seeds are floating about in the air, ready to plant themselves and grow in milk, with the certain result of converting the nutritious food into a poisonous fluid, it is hardly possible to believe that they would continue to offer every facility for entrance of the dangerous germs, instead of obstructing it by every means in their power.

Milk may be made poisonous in two ways. By the entrance of septic organisms, and by the action of disease-producing or pathogenic organisms. These two causes of contamination require separate consideration.

Effects of Septic Bacteria on Milk.

Septic poisoning is a well-known result of the injection of a small quantity of putrid matter into the blood of an animal.

For purposes of experiment it is usual to use meat infusion which has been left open to the air until it has become putrid, or has been inoculated with septic organisms, and kept for a short time at a certain temperature. Milk is not used as a culture medium in the laboratory, indeed, owing to the presence of fat, it is not adapted for the purpose, and therefore comparatively little is known of the effects of septic organisms in changing its composition, but the few facts which have been observed lead to the conclusion that it is particularly susceptible to septic action, and undergoes putrefactive changes very readily.

It may be urged that poisoning is not likely to result from the use of putrid milk, as no one would take the fluid in that state; but milk products, butter and cheese, are constantly con-

sumed in a septic state, *i.e.* when septic fermentation has been set up, and the difficulty is that no one knows what are the indications detectable by taste or smell, or more accurately by chemical and microscopic examination, on which an opinion may be based.

Dr. Voelcker determined the poisonous properties of a certain cheese by the mere accident of swallowing a portion of it unmixed with other food; but if he had taken the cheese at the end of his dinner, it is almost certain that his illness would have been referred to any of the other articles, solid or liquid, which he had taken in the course of the meal, rather than to the small quantity of cheese with which the meal was ended; and so in our common experience we may partake of cream, butter, or cheese in which bacteria have been at work, and have produced out of the fats or albuminoids poisons (ptomaines or alkaloids) in quantity sufficient to cause disorder of the organism of the persons who take them. But neither the cream, butter, nor cheese, are taken alone, and so escape suspicion of being responsible for the harm which has been done.

It may occur to the reader that this suggestion of a possible state of milk, butter, and cheese, in which a mysterious and undetectable poison may exist, is not a comforting doctrine. There is, however, consolation to be found in the fact, that the animal organism possesses a resistant power which renders it to some extent proof against the action of septic bacteria when taken into the digestive organs, and subjected to the action of the secretions. In fact, many things may be eaten with impunity which would be deadly if injected into the blood stream. Still it is true that, at a certain undefined state of septic fermentation, milk and its products do become deleterious, in spite of the corrective influence of the digestive process. This was proved by Dr. Voelcker in the case of cheese a long time ago; and by the writer more recently in the case of milk. A number of experiments made on calves by feeding them with milk containing organisms derived from sores on cows' teats were attended with remarkable results. The animals fed on the milk suffered from eruptions on the nose and on the mouth, associated with diarrhœa and emaciation. In some cases death followed from septic poisoning. These results of the ingestion of contaminated milk are not pleasant news to the consumer of milk. After all, is it desirable to deal in soothing platitudes when there are abuses to be remedied? What can be said in favour of the average practice—science being out of the question—of dairying? Cow-sheds, cows, milkers' hands and clothes, and milking utensils, all defiled with filth; an atmosphere

charged with septic germs, and volatile products of decomposition infecting the outer air even, and informing the passer-by of the vicinity of a dairy farm. This is the unsavoury truth, which doubters may test by a short tour through our dairy districts.

On the opposite side a more pleasing picture may be painted. It has already been stated that some dairy companies have shown what can be done in the way of collecting and distributing milk under such precautions that the risk of contamination is reduced to the smallest degree, and the only hope is, that by the institution of Dairy Schools and Dairy Associations it may come in time to be an article of belief, to be enforced in practice, that cows and milkers, with the sheds and all the surroundings, may be kept perfectly clean, *i.e.* in a condition which may be strictly defined as *aseptic.* Legislation has not done much in the way of improving the sanitary state of cowsheds and byres in the country where, it might be supposed, all the surroundings are most favourable, as indeed they are, if only advantage were taken of them, but it has done some good in towns, the Metropolis for example, where the Local Authorities have taken some pains to enforce their powers. There is ample power now vested in Sanitary Boards, but they are allowed to lie dormant in most cases, and perhaps better results may accrue from the diffusion of sound knowledge among dairymen than from the making of regulations which are generally disregarded.

Effects of Pathogenic Organisms on Milk.

Only a mere sketch of a vast subject can be introduced here. And first it must be distinctly stated that organisms which cause specific diseases are capable of being cultivated in proper media or soils just like other plants. There is nothing remarkable in the fact, excepting its relation to the invisible. If the bacillus of anthrax had seeds of the size of mustard-seeds, no one would wonder to see them grow into plants; but as the seeds (spores) are inconceivably small, quite invisible unless highly magnified, it seems curious to reflect that they may be planted like other seeds, and with a like result.

Micro-organisms grow freely in solutions of animal matter, broth made of beef, veal, chicken, or pork; and therefore there is no reason for surprise that milk should be an excellent culture medium, although for the reasons previously given it is not a convenient medium for the bacteriologist.

It will be understood from the above remarks that infective microbes, whether derived from diseased human beings or from

the lower animals, will live and grow in organic fluids, and some of them, probably most of them, will flourish in milk.

Among contagious diseases, small-pox, scarlet fever, typhoid fever, and diphtheria, may be quoted as affections which are alleged to be most readily spread by the agency of milk. It is easy to explain this fact by reference to the well-known circumstance that persons suffering from these diseases are often able to attend to their work; and in the event of milkmen being the sufferers, the milk will probably become infected. And it must at least be admitted that circumstantial evidence points to the conclusion that all the diseases named have at different times been spread by the agency of milk, although it must also be allowed that in many of the outbreaks which have been attributed to this source no positive proof has been adduced. The fact of diseases appearing only in a proportion, often a small proportion, of the customers of a particular dairyman, has been accepted as evidence of the milk being infected even when no human source of contamination could be detected, and lately the failure to discover such source of infection has led to the cows being suspected of originating the disease. This subject has been fully discussed in Reports issued from the Local Government Board and the Agricultural Department of the Privy Council.

Certain diseases to which cattle are liable are known to infect the milk, for instance, foot-and-mouth disease, tubercle, and anthrax. More than twenty years ago the writer found very characteristic morbid products in the milk of cows affected with foot-and-mouth disease.

In the early stage the specific gravity of the milk was low—1024—and the fat globules were clustered in masses, and there were numerous small spherical bodies (micrococci), and other septic microbes. When foot-and-mouth disease is fully developed, the condition of the milk is very characteristic. The fat globules are intermingled with large granular cells, micrococci are more abundant than in the early stage, and they are seen in chains (streptococci) of various lengths, being composed of four up to twenty or more elements. Milk so contaminated with morbid products is often fatal to calves in a few hours, although in other cases they take it with impunity; cats fed on it became ill, and refused afterwards to take the fluid.

Milk from cows affected with foot-and-mouth disease, especially if the eruption occurs on the teats, has proved injurious to man, according to observations in this country and on the Continent. It must, however, be evident that the danger of communication of the disease to the human subject cannot be very great, otherwise cases must have been far more numerous

than they were during the constant and often extensive prevalence of the disease from 1839 to 1885, the number of animals attacked sometimes amounting to many thousands in the course of a week.

In considering the cases of alleged foot-and-mouth disease in man, it must not be forgotten that the symptoms are not well defined—fever, with the occurrence of blisters on the tongue and lips, are the indications of a common cold, and they would not be suspected to arise from Foot-and-mouth disease unless under circumstances which rendered it certain or probable that milk from diseased cows had been taken, as it must have been very largely indeed, during the existence of the disease among dairy cows. That the milk in foot-and-mouth disease is poisonous to young animals is certain, and it may be added that the appearances indicated in Fig. 2 do not suggest its fitness for human food.

Tuberculosis in dairy cows is a disease which is, unfortunately, not uncommon, and appears to be increasing. The affection does not spread rapidly among the animals of a herd like other animal plagues, and for this reason it has not attracted much attention from stock-owners and veterinarians. Recently the existence of tubercle in several of the animals used for food has been the subject of much discussion, but chiefly with reference to the probable effects on public health of the consumption of meat and milk of tuberculous animals.

Experimental proof of the transmission of tubercle from diseased to healthy animals by inoculating or feeding with tuberculous matter is abundant enough. The facts are briefly as follows.

Meat and milk in which tubercle is present will produce the disease in the lower animals. It is not proved that human beings are liable to infection with tubercle derived from animals; but it may be accepted as a probability, and no one would be likely to incur the risk knowingly. On the other hand, the flesh and milk of tuberculous animals do not appear to be infective unless the tubercle bacilli are present. A case of recent occurrence will illustrate this point. An old cow affected with tuberculosis, in which the udder was implicated, was purchased for experimental purposes. The milk of this animal was found to contain tubercle bacilli, and rabbits fed on it, and others inoculated with it, died with the disease well marked. The cow was killed, and proved to be affected with tubercle in nearly all the chief organs of the body, including the lymphatic glands, some of which were enormously enlarged with the deposit. Rabbits fed on the flesh of this animal some months ago are still in perfect health. Infection of milk with tubercle appears to be conditional on the

presence of the disease in the udder, and the most satisfactory test of the contamination of the milk is the appearance of the specific organism of tubercle under the microscope, by the aid of which the bacilli can be readily detected in properly stained preparations.

ANTHRAX.—This is a fatal disease commonly known as splenic fever in cattle and other animals. Accidental inoculation during post-mortem examination, or while handling substances contaminated with anthrax organisms, prove beyond doubt that the disease is communicable to man. The milk is not likely to be a source of infection, because the anthrax organism does not appear in the blood till shortly before the death of the animal, which generally takes place very suddenly.

Enough has been written in the preceding pages to prove that milk is constantly exposed to contamination with impurities which may be derived from food, air, or water, or from changes due to disease. It has also been shown that the contamination may in most cases be prevented by care, and when it cannot, as may happen when the cause exists in the organism of the cow, the milk is not fit for consumption. Meanwhile until proper care is taken universally and, if needs be, under stern compulsion, the consumer who is at all apprehensive may protect himself and his family by bearing in mind that milk is animal food, and should not be taken raw.

Scalding milk, a process which is common in Devon and Somerset, is a method of cooking milk which is convenient, and on sanitary grounds in every respect desirable. Some experiments were made by the writer at a recent meeting of the Bath and West of England Society with the apparatus which had been lent by Sir Thomas Acland, and it was found that at the moment when the experienced dairymaid in attendance decided that the milk pan must be removed from the stove the thermometer in the milk indicated 170° Fahrenheit, a temperature at which most of the septic and infective microbes would be killed, both in the cream and in the milk. Unfortunately a large proportion of milk-consumers object to the flavour of milk or cream which has been scalded; under such circumstances they must incur the risks which attend the use of raw milk, or adopt the only alternative, and abstain from using it as an article of their food.

XI.—*Dairy Industry, Past and Present.* By George Gibbons, Tunley Farm, Bath, Acting Steward of the Dairy Department of the Bath and West of England Society.*

The industry we are about to consider is one of the oldest and most important of the world's occupations; and the many references to it (too well known to need recapitulation) in the pages of Holy Writ, bear eloquent testimony to its antiquity.

Milk.

In milk, which, as the first of dairy products, is entitled to priority of consideration, we find all the elements required from infancy to build and sustain the human frame; and truly is it said that the most skilful compounder of so-called goods can only imitate it, whilst the chemist gives it up in despair.

Among early writers who refer to it may be mentioned Aristotle, who divides it into two parts, watery and caseous; and Galen, who says, "Cow's milk is the best, sheep's and goats' less good, and asses' the poorest."

Mr. J. T. Rogers, in his "History of Agriculture," states that in the thirteenth century British cows were sold at 5*s.* each, and let by the owners, who found food for them, at 5*s.* to 6*s.* 8*d.* per annum. In the fourteenth century milk was sold at 1*d.* per gallon, cream at 3*d.* per gallon, and butter at 6*d.* per gallon. Milch cows were worth from 8*s.* 6*d.* to 10*s.* each. Three buckets cost 4*d.*, a churn 4½*d.*, cheese-tub 8*d.*, and the dairymaid's wages were 6*s.* per annum.

In Tusser's "500 Points of Good Husbandry," published 1573, we read:—

> "Good dairy doth pleasure,
> Ill dairy spends treasure.
> Good housewife in dairy that need not be told,
> Deserveth her fee to be paid her in gold."

Gervaise Markham, in the "English Housewife," 1660, recommends "large cows, as when age or mischance shall disable her for the pail, she may be fed and made fit for the shambles, and so not lose, but profit. The signs of plenty of milk in a cow are a crumpled horn, a thin neck, a hairy dewlap, a very large udder with four teats, long, thick, and sharp at the end, for the most part white, of whatsoever colour the cow be, and if it be well-haired before and behind, and smooth at the bottom, it is a good figure. The housewife to choose from the

* A Paper read before the Economic, Science, and Statistical Section of the British Association.

different breeds, according as her opinion and delight shall govern her, and he advises her getting them from a harder soyle." To this most excellent advice he adds "for the ordering of milk," what cannot be too strongly emphasised in the present day, "not the least mote of filth may by any means appear, but all things either to the eye or nose, so void of sourness and sluttishness, that a princess's bedroom may not exceed it."

The addition of such milk to such beverages as tea and coffee dates from about 250 years ago, but in the land of tea (China) no such admixture is practised.

The increased demand for milk in our large centres of population during the last twenty years is a source of congratulation from every point of view. Considerable physical benefit is derived by the use of such an unequalled beverage. The farmer is only too happy to supply it, the railways receive from its carriage a considerable and constantly increasing revenue, and a new industry has sprung up to meet the demands for the churns required for its transit.

Prior to the year 1865 the large bulk of the milk consumed in London was produced within it, but the cattle-plague which then broke out swept away more than half of the cows in the metropolitan area in the course of a few months. The continued outbreaks of pleuro-pneumonia and foot-and-mouth disease for some years after so reduced the number of town-kept cows that only a few, comparatively, are now found in London. Doubtless the necessary regulations imposed by the Metropolitan Board of Works for the proper sanitary condition of urban dairies has also tended to reduce them further.

Mr. Tisdall, of the Holland Park Dairy, London, in a letter recently received from him, says: "The cows in and near London have been reduced quite 75 per cent. The supply of milk is fully equal to the demand, but the consumption has increased lately, as the public appear to have appreciated more accurately its real nutritious power, especially in comparison with other more seductive but less useful fluids. The Sale of Food Act has been very beneficial to the fair trader. It is a terror to evildoers, a boon to every honest dairy farmer, and a great protection to the public."

The main development of the present large trade in milk is comprised within the last twenty years, and the tendency of the present day to concentrate matters in the hands of companies is evidenced by the fact that the large bulk of the wholesale milk business in the metropolis is in the hands of a very few men; and the producer, who too often gets only a sweating price for his milk, may well look with moistened eyes on the

dividends, varying up to 18 per cent., extracted from it by these metropolitan milk lords. I have been favoured by the general managers of our main lines to London with some interesting statistics with regard to the conveyance of milk.

Mr. Lambert, of the Great Western Railway, says that in 1865 his company only conveyed to London some 500,000 imperial gallons of milk, but that last year the quantity was 8,500,000. Prior to 1865 there was little or nothing sent by them.

Mr. Noble, of the Midland line, says that in 1886 they carried 6,436,920 gallons to London; that, comparing the year 1888 with that of 1876, their carriage of milk to London has increased nearly threefold; and that as between 1879 and 1888 the quantity they have conveyed to other towns has increased about 30 per cent.

Mr. Scotter, of the London and South Western, says that in 1883 they brought to London 5,186,674 gallons imperial, and in 1887, 5,640,193 gallons.

Mr. Oakley, of the Great Northern, says that their traffic in milk increases yearly, and that last year it amounted to 2,700,189 gallons.

A most perfect mode of preserving milk sweet for an indefinite time is that adopted by our large steamship companies, who place enough milk for a day's supply in a separate vessel or can. Enough of these are provided to last the voyage, and then placed in a compartment below freezing-point. And thus a perfect supply of sweet, genuine milk is provided without the trouble of taking cows on board, as formerly.

UTENSILS.

The methods used for the separation of cream and milk are many in number and widely different in mode. They show how extremes meet; for, by the most diverse systems, fairly even results can be obtained. One says, "Put your milk in shallow tins or pans, surrounded by sweet, fresh air, as they did in the good old times, and you get the best results." Another says, "No, it's only old fogies do that now; put your milk, on the 'Schwartz' or 'Cooley' principles, into deep, narrow vessels; immerse or plunge them into the coldest of water, and you get the whole volume of cream raised between the milkings." Whilst a dainty Devonshire dairymaid assures you these cold water systems are nowhere compared to her's; that you must have the hottest water to ensure delicate, delicious cream and butter. Then, again, we are informed that the

"Jersey system," which, it is claimed, combines all the best conditions of the old and new methods of raising cream, is the sweetest, surest, safest, and soundest. Lastly, we are told that all these varied lauded methods are obsolete; there is no need of placing your milk in either hot or cold water; that the shallow pans and deep ones, the Cooley, Schwartz, and Devonshire systems, have all been left long behind by the grand machine into which you place the milk hot from the cow, whirl it round 6000 to 7000 times per minute, and thus get entire and complete separation of the cream at the rate of from 40 to 160 gallons per hour, according to the size of the machine, thus enabling you to dispose of the milk whilst it is still naturally warm. A man can work an ordinary separator, powerful enough to separate over 20 gallons a hour; and a woman, a "Baby" separator, separating 12 gallons in the same time. To Sweden and Denmark belong the honour of inventing these centrifugal cream separators, and their introduction marks the most important advance made, of late years, in dairy husbandry, many thousands being now in daily use, both in large and small dairies. The chief advantages to be derived from their use may be thus summed up: an almost unlimited supply of sweet, separated milk, so valuable for children, at a very low price; the entire (if desired) abstraction of the cream (in its purest and sweetest condition), which places a delicacy (not to be obtained, until lately, even at the best hotels) within reach of all, at a most moderate price; and the means of dealing with much larger quantities of milk than was possible under the old system.

BUTTER.

The making of butter has been practised from very early times, and frequent allusions to it are found in the works of early writers. Herodotus mentions that the Scythians poured milk into wooden vessels, which they caused to be violently shaken, and separated the part rising to the surface. Hippocrates prescribed butter applied externally as medicine, and calls it "Pinkerion." Anaxandrides, contemporary with the above, in describing the wedding of Sphicrates, the daughter of the King of Thrace, states that the Thracians ate butter, to the amazement of the Greeks. Tertullian alludes to butter as an ointment, and Hecatus speaks of it as oil of milk used for anointing.

From many testimonies it appears butter-making was communicated to the Greeks by the Scythians, Thracians, and Phrygians, and that the Romans learnt it from the Germans,

who appear to have used it rather as a medicine, or ointment, than food. The art of butter-making must have been known in England at a very early date, as Cæsar tells us, when he invaded this country, he found butter the common food of the islanders. The earliest mention of a barrel of butter is found in the year 1514, as it realised 12*s.* 5*d.* In 1549 it was sold at 1*s.* per gallon. The price of a good cow in 1502 was 8*s.*; in 1525, 10*s.*; and in 1555, 20*s.*

It is generally known that butter is made from the fatty globules contained in milk, and in the Cantor Lecture published in the "Journal of the Society of Arts" for last month, Mr. Richard Bannister says:—"A pound of milk with 4 per cent. of butter fat in it contains about 40,000,000 of these globules. Small as is the largest of these, yet there are some considerably smaller than others, and it is to this difference in size that certain descriptions of milk, containing the same percentage of fat, exposed to like conditions, will not yield the same quantity of cream in a given time. The larger globules rise first, and so on to the smallest, which will scarcely rise at all. From a vessel of milk which had been allowed to stand fourteen hours, samples were taken from different depths, and the size of the globules measured as accurately as possible, with the following results:—From surface of cream, diameter of average globule was $\frac{1}{6120}$ inch, from lower layer of cream $\frac{1}{6640}$ inch, and from 6 inches below the surface $\frac{1}{8260}$ inch. In practice it is found that the larger the globule the more easily the cream is churned into butter."

Oftentimes now we hear, "Butter will not come." In 1553 butter churns, for bringing butter when it will not come, were sold, and one hundred and thirty years ago Thomas Hale in his "Compleat Body of Husbandry," says:—"There is a great uncertainty as to the time of butter coming; but this depends upon the manner of beating. Let the mistress examine the manner of working of those who complain; she will commonly find that laziness is the devil in the churn that acts his spell upon the butter; let her oversee the work, that it is done briskly, with swift sharp strokes, and tell the people for their own sakes to continue in the same manner, and the desired effect will soon follow." And I think old Thomas Hale was about right.

The value of the total quantity of butter imported by us last year was 11,886,717*l.*, being over two millions more than in the year 1877.

The value of butter exported by us last year was 155,901*l.*, as against the sum of 719,993*l.* in the year 1859.

CHEESE.

In the Bible cheese is mentioned but three times. Job must have had a thorough knowledge of its manufacture, for, in order to illustrate the unrest and ferment of his mind in the days of his adversity, he says—"Hast Thou not poured me out as milk, and curdled me like cheese." In 1 Samuel, c. xvii., v. 18, Jesse gives directions to his son David "to carry ten cheeses to the army, for the captain of his brethren's thousand." And in 2 Samuel, c. xvii., v. 28, is related the fact of his being repaid in kind by Barzillai and others, who brought "Honey, butter, and cheese of kine for David and the people with him to eat." 350 B.C. Aristotle refers to cheese, and Virgil, in his "Georgics," as translated by Bathurst, alludes to cheese-making in the following lines:—

> "The morning's milk they put to press at night;
> That which is yielded at the waning light,
> Placed in large cans, is by the shepherds borne
> To neighbouring towns at the first blush of morn;
> Or, press'd and slightly salted, is laid by
> To form, for Winter's use, a fresh supply."

Cæsar states that the Germans made cheese, and that the art of cheese-making was introduced into England by the Romans. Mr. J. T. Rogers, in his "History of Agriculture and Prices," mentions that English cheese was sold in the year 1260 at $\frac{1}{2}$*d.* per lb., in 1278 at $\frac{3}{4}\frac{3}{5}$*d.* per lb., in 1381 at $\frac{3}{4}$*d.* per lb., in 1468 at $\frac{1}{2}$*d.* per lb., and in 1549 at $1\frac{1}{4}$*d.* per lb.

At a banquet given by the Prior of St. Augustine's, Canterbury, in the year 1309, to 600 guests, we are told the fish, cheese, milk, onions, &c., cost 2*l.* 10*s.*

Walter De Henley calculated that two cows produced, between Christmas and Michaelmas, 2 cwt. of cheese worth 8*s.* per cwt., besides 20 gallons of butter worth 10*s.* Thus the value of the produce per cow was 9*s.*, but, he adds, "they must be kept on good pasture to produce so much," as on lighter pasture it took three to make that value.

In English cheese is found an unsophisticated, natural, wholesome, nutritious article of food, the richness of which is derived, not from oily compounds, but from butter of kine, and its sweetness and aroma from the grass that grows "for the service of man" on our hills and dales. In this beautiful county of Somersetshire, where the fallow deer roams as in the days when the Druids cut the sacred mistletoe (a plant which is turned to better account by the youthful Britons of to-day); there is found the only pack of hounds in the world that hunts

the wild deer; and where the highest average rent per acre is paid of any county, save Middlesex—in this favoured county is, and has been for many years, produced that famous cheese known all over the world as "Cheddar." When it was first made, we know not; but from a very early time the dairy industry must have been important at Cheddar; for a Banwell Charter of 1068, quoted in a paper, read in 1887 by F. H. Dickinson, Esq., to the Somerset Archæological Society, speaks of "Nine heordes and the common land up above milking way." These "nine heords," Mr. Dickinson supposes to have been the pasture on the Cheddar pasture common for nine beasts for the bishop's people, perhaps his own, in the king's land there.

"PENNARD, *August* 21*st*.

"SIR,—In regard to the big cheese, it was the produce of 730 cows, and was, as you say, presented to the Queen; but in an evil hour permission was asked to exhibit the cheese, which was granted, and there began a series of disputes which only ended in Chancery, and when the cheese once arrived there, I leave you to guess what became of it. I suppose it was speedily eaten up by those sharks called judges and lawyers. The cheese weighed 11 cwt., measured 9 ft. 4 in. in circumference, 20 in. deep, and was ornamented with the Royal arms. I don't suppose the quality was very good, as we for the most part find that cheese made from different dairies mixed together is not, as a rule, first class. I do not know when cheese was first called Cheddar, but as Cheddar has always been a well-known place, I suppose it gave its name to cheeses made in the district. There is a statement in 'Beckman's History,' under the article 'Butter' that cheese was known earlier, but there is no proof given . . . .

"T. NUNN, Vicar."

The Rev. Preb. Coleman, of Cheddar, has favoured me with the following interesting correspondence about cheese made in that parish, which is taken from Brewster's State Papers.

Vol. 301, Temp. Charles I., November 16th, 1625. Edward Viscount Conway (Secretary of State) to John Lord Poulett.

Reminds him of a "cheese of Cheddar" he was to send the writer.

Ditto, Vol. 302. November 30th. John Lord Poulett to Edward Viscount Conway.

"Has sent to take up all the cheeses at Cheddar for him."

Ditto, Vol. 303. December 13th, A.D. 1635. Same to same.

"Sends a Cheddar cheese, and apologises for sending but one. They were wont to be common in that county, till now they are grown in such esteem at the Court that they are bespoken before they are made."

Ditto, Vol. 311. January 13th, 1636. Same to same.

"Sent a Cheddar cheese, and now sends two more which are all that can be gotten of last summer's making; if he likes them, will take care to victual him better against another winter."

Ditto, Vol. 319. April 20th, 1636. M. Angleworth to George Rawden.

Partly as to the purchase of six Cheddar cheeses, which Lord Conway wanted.

Professor Freeman, in his presidential address to the Somerset Archæological Society in 1871, quotes a letter from the first Earl of Shaftesbury to his illustrious Somersetshire friend, John Locke, in which he tells the latter, "Somersetshire no doubt will perfect your breeding; after France and Oxford, you could not go to a more proper place. My wife finds you profit much there, for you have recovered your skill in Cheddar cheese, and, for a demonstration, have sent you one of the best we have seen." Mr. Freeman adds: "It is pleasant to find our local cheese had already won a reputation which it still keeps;" and further says the statesman winds up with this strange blessing on the philosopher: "Thus commending you to the protection of the Bishop of Bath and Wells, whose strong beer is the only spiritual thing any Somersetshire gentleman knows."

If "imitation be the sincerest form of flattery," then the makers of Somersetshire cheese cannot complain of any lack of attention in this respect. Our 'cute American cousins carefully studied the various systems of cheese-making in the old country, and long ago decided that the Cheddar was the one they could best adopt. With such energy have they acted upon this that for the last ten years their average exports to us have exceeded 1,000,000 cwt. per year, causing the blunt outburst from a home producer that he "wished the cussed country had never been discovered!" Our fellow-subjects in Scotland have made it the main make of their large dairy district; whilst that Greater Britain, the Dominion of Canada, has lately so pushed her way to the front in the production of cheese that last year she exported to us 631,837 cwt., almost the whole of which was described as Cheddar.

The system is being rapidly extended in Australia and New Zealand, which, together, with Russia, Sweden, Norway, Holland, and the Azores, supply us with large quantities of so-called "Cheddars."

The total quantity of cheese imported by us last year was 91,723 tons, valued at 4,508,937*l.*

It is sometimes stated that the quality of English cheese has deteriorated; in some cases where early maturity has been the main object, the charge is true; but there is no doubt that the general make of cheese is a better quality now than it ever has been, and excepting perhaps the fancy variety of "Gorgonzola," which is now made in England of excellent quality, no cheese in the world equals the best makes of our Cheddar and Cheshire.

Not infrequently are we told that "it is an evidence of the lethargy and supineness of the British farmer," that dairy produce to the value of nearly 17,000,000*l.* is imported into

this country. Do those who say so know that it costs about 25 per cent. less to convey cheese from America or Canada to either London or Liverpool than it does from Bath to those places? Do they further know that the local payments for taxes, rates, and tithe (of which our foreign competitors know little) amount, according to the locality, to from 20*s.* to 30*s.* per cow per year?

Are they aware that twenty-eight years ago the export trade of cheese and butter from Britain amounted to the value of 1,577,464*l.*, which has now dwindled down to 368,532*l.*, the trade being well-nigh strangled by the foreign duties imposed? This charge of apathy and supineness against the British farmer is no more reasonable than it would be if applied to the home-producers of mineral oils, because they did not prevent America alone, in 1886, sending us nearly 70,000,000 gallons of petroleum. It would be equally fair to say that the shrewd ironmasters of the north were not up to their business because they allowed the little country of Sweden to send us 150,000 tons of iron and steel in 1886; that the men of the potteries were asleep because Japan sends us over 6,000 cwt. of china and earthenware; that the men of St. Helens were behind the times because Germany sends us nearly 200,000 lb. weight of beads a year; or that the art dealers were below the mark because Germany sent us over 14,000,000 of prints, engravings, and photographs in 1885.

At the same time, there is no doubt that much of our home-made cheese is not of equal quality to that imported. Here a fair charge can be made against us, and it is our bounden duty so to improve its manufacture as to keep well ahead of our competitors. Some say, beat them with their own weapons—erect factories, and work them on the system that has produced such results abroad; but generally our farms have the buildings and conveniences required for cheese-making, and farmers' wives and daughters make the cheese. Evidence of the superiority of the home dairy manufacture may be found in the fact that, at the great International Dairy Show, held at New York in 1878, where cheese from England competed with the choicest productions of the American and Canadian factories, the two first prizes were awarded to six Cheddars, made at a dairy near Bath.

This is not the time or place for an essay on the method of making the finest cheese; but I will venture to mention what I think are its essential characteristics, viz., fine mellow texture, sweet, aromatic flavour, and pure, rich buttery quality.

That most honest and outspoken of Englishmen, Archdeacon Denison, has favoured me with the following remarks:—"I

have satisfied myself, from a long and curious correspondence I had some years since, that Cheddar cheese as we have it in its true manner and matter has not been a marketable commodity till about sixty to sixty-five years ago; was not then to be had for money, except by way of private bargain or loving gift, as a very precious thing. Looking back, I can see it a wedding gift of choicest quality, confined absolutely to this soil and climate; a rare and precious natural monopoly. It had reached its highest fame about the time when I first knew Somerset, forty-five years ago. It was then two of my dear friends, Somersetshire men, the late Francis Popham and Fitzharding Portman, said to me, 'Denison, we have one piece of advice to give you.' I thought it was advice moral or purely religious, and said, 'What is it?' 'Mind you never touch a Cheddar cheese until it is two years old.' 'Certainly,' I said; 'I will take all care not to do it.' I have a great respect and love for the people of Somerset and for Cheddar Cheese; and I have an unmitigated contempt for all the attempts to make it apart from the same soil and climate which is found so largely in Somerset; here and there it may be made out of Somerset, but only in rare instances. I have never had any instance of this good fortune presented to me, but many trumpery, nasty, and short-lived imitations, both from America and England. I have eaten of two Cheddars lately made in my own neighbourhood, one four years old the other two; both, especially the oldest, of primest quality in every respect, sound, sweet, mellow, moist, with no single trace of animal life about them." The venerable archdeacon concludes by saying he is sorry that his letter (of which I may make any use I please) is longer than it should be, but he feels with the old Latin poet, "*Facit indignatio versum.*" My indignation makes me write!

THE INFLUENCE OF SOILS ON DAIRY PRODUCE.

The influence of soils on dairy produce has been much debated, and, by some writers, reduced to a minimum.

On this subject I would quote the opinion of my father-in-law, the late Joseph Harding, of Marksbury, to whose researches, labours, and writings the dairy industry of this day is much indebted.

In a paper, in my possession, on the "Soils of England," he says, "I have divided them into three classes: the first class for making meat; the second class for making butter and cheese, because it is most suitable, and the other two are not suitable: and the third class for rearing young stock, because it is incompetent to do the work of the first and second."

One of the largest and most experienced cheese merchants in the West of England writes me as follows :—"It is well known that various soils have their characteristic herbage, and, consequently, their influence is great, not only on the quantity and quality of milk, but also on the character and flavour of the cheese produced from cows fed on them. As a rule, the cheese made on very rich land is coarse in flavour, and that made on very thin land is deficient and weak in flavour. Cheese made off peat land is seldom good. The best land for cheese-making appears to be that which is not very rich in quality, but produces what is called 'sweet herbage.'

"A few makers seem to be endowed with a peculiar instinct, which enables them to produce fine cheese under almost any condition as to soil; whilst others, who have been most successful on one farm, make, when removed to another, a very inferior quality. Others, again, who for years have produced the finest quality, will suddenly fall away, and it is seldom they quite regain their former perfection. In most cases the failure cannot be attributed to carelessness; occasionally it is caused by the altered condition of the land under a different system of management, but, as a rule, the only explanation to be given is, that the 'hand has lost its cunning.'"

Another eminent Somersetshire firm says: "We certainly think soil has a great deal to do with the quality and flavour of cheese; the best being made on old pastures; recently converted land certainly has no chance of producing such good cheese as that of old pastures."

In a valuable paper contributed to the 1877 Journal of the Bath and West of England and Southern Counties Agricultural Society, Mr. Peard says: "Many dairymen maintain that a first-class quality of cheese cannot be produced on certain lands, and that good old pasture yields a better quality of cheese." Nor is this line of thought without a fair show of reason to support it. Old pastures usually abound in thyme and other plants, which, it is assumed, yield greater richness and aroma to the milk. The late Professor Buckman gave it as his opinion, that "the most noted dairy produce is derived from the New Red Sandstone."

Personally, I have every reason to believe that the difference of soils is a most important factor in the quality of the dairy produce made from them; and that whilst a good, useful article can, by the best management, be made almost anywhere, yet the most delicately flavoured cheese and butter will be produced on soils not too rich, but which grow natural clovers, grasses, and herbage of the sweetest quality.

I would also point out the injury which arises from keeping

any quantity of sheep on lands fed by dairy cattle, to the cheese made on it.

As a matter closely connected with dairying, a reference may be made to the continued increase in the permanent pasture of our country. In the Agricultural Returns for last year, on page 15, appears the following: "It is remarkable that, in spite of the increased acreage under permanent pastures and clover or artificial grasses in Great Britain, the stock of cattle has fallen off considerably in the past year; each of the several classes of this stock, as distinguished in the Returns, participating in the result; the total number being now 6,441,268, equal to 3 per cent. less than in 1885."

From the partially-published Returns for this year, it appears that there is a further decrease of 312,044 head of cattle, or 4 per cent. less than the reduced numbers of 1887. But this decrease of the past two years will, perhaps, cease to be considered remarkable when we look at the decrease of the past twenty years.

In 1868, with 16,096,044 acres of permanent pasture clover in Great Britain, we fed a total of 38,443,916 head of cattle, sheep, and pigs. This year we only keep 33,789,680 cattle, sheep, and pigs on an area of 20,500,000 acres of permanent pasture, clovers, &c.; so that with an increased area of permanent pasture and clovers this year, equal to 4,500,000 acres, as compared with 1868, we have a decrease of 4,654,236 head of cattle, sheep, and pigs.

The serious nature of these Returns lies in the fact that, with our increase of permanent pasture, which some consider such an unmitigated blessing, we lose not only the whole of the corn that was grown on these lands, but also one head of live-stock for every acre thus laid to grass. If to this we were to add the national loss arising from the greatly diminished labour on these lands, the total loss would be much more intensified.

Now, if I were asked what is the chief deficiency in our national system of dairying that prevents a full utilisation of the products at our disposal, I should reply, the lack of education. In this, the richest country in the world, which is year by year getting more dependent on other lands for its supply of daily bread, even to the extent, it is said, this year of nine months out of the twelve, nothing practical has ever been done by the State for the promotion of technical instruction amongst its agriculturists. What a world of truth there is in the following eloquent passage from a paper by Sir R. Paget, Bart., M.P., read before the International Congress of Education, held at the Health Exhibition, in August, 1884:—

"When foreign art, taste, and skill successfully invaded our

home market, our manufacturers were not slow to demand State aid for technical schools to enable them to hold their own. Would it not be worse than folly that we, inspired by a spirit of extravagant self-reliance, should rather remain an example of suffering, sad humanity than boldly prefer the reasonable demand that State aid should be given to agricultural science?"

In America, Canada, and nearly every European state this aid has been given with the best possible results. Take the improvement due to dairy instruction in Denmark as an example. Not many years ago the butter made there was *execrably bad*, but through the impulse given by the Royal Danish Agricultural Society, and afterwards at the expense of the State, men of science set about solving problems and making investigations relative to conducting dairy management upon rational principles: the result is stated by the Danish Agricultural Department of this year, thus: "From 1877 to 1882 the average annual export of butter was 19,000,000 lb., which in 1887 was increased to 35,000,000 lb., commanding the highest price in the English market."

I trust, however, that in the near future there is a prospect of the Science of Dairying receiving an impetus it has never had before; the Government, the agricultural societies, and the people alike becoming alive to its value. A united effort of this kind is certain to meet with success, and may the general output of dairy produce in this country soon rise to the perfection of its best makers, than which the world produces no finer.

XII.—*The Effects and Lessons of the Wet Summer of* 1888. By R. HENRY REW, F.S.S.

THE British farmer of these latter days has a sufficiency of teachers. Some of them have messages of practical value which do not always, it may be, meet with the appreciation which they deserve. Others, lacking themselves the knowledge of what farmers do or do not know, or of what they require, affront them with advice which they neither need nor understand. But there is one agricultural teacher whose lessons are always precious, and that is the great schoolmistress Nature. Year after year there is something to be learnt from the pages of her endless book by those who will but stay to read and receive her teaching. To the attentive farmer every season has its own special lesson, which, if fairly learnt, will fit him more fully for future labours, and enable him to grasp the principles of his art more closely.

Therefore it is that in nothing is the farmer more wise than

in searching out and studying such lessons as the seasons in their flight may have for him. The summer of 1888 was, in some respects, exceptional. In the title of this article it is termed a "wet" summer, and the description will be commonly accepted as true. Yet its peculiarity lay rather in a continuance of dampness than in an excess of rainfall. As a matter of fact, the amount of rain which fell was scarcely, if at all, above the average. Nevertheless the summer quarter was, by general consent, deserving of the character of "wet," by reason of the fact that, during the whole time, there were scarcely ever more than (and seldom so much as) two consecutive days without showers. The prevailing dampness was characterized by the absence of bright sunshine, and the general lowness of temperature. At the end of September the following remarks were issued by the Meteorological Office, which fairly describe the peculiarities of the weather up to that date:—

"In the south-west of England there has not been a single week since the commencement of March with the temperature above the average, and only two weeks since the beginning of the year; and in the north-west of England there has been no warm week since the middle of May, and only three this year. In the Midland counties there have been but four warm weeks this year, and in no English district has the temperature been above the mean in more than seven weeks out of the thirty-seven weeks already expired. The mean temperature of the British Islands for the nine months ending September is about 2° or 3° below the average, and is colder than any year since 1866, with the exception of 1879, which was only 0°·1 lower; the period for the three months, however, ending September is colder than any corresponding period during the last twenty-two years, and is 4° or 5° colder than in 1868, 1878, or 1884. Notwithstanding the very wet summer, the total rainfall for the nine months is deficient over the entire Kingdom, except in the eastern districts of England and in the north of Ireland, and in no case is the excess at all large. In the south-west of England the deficiency on the average fall is 6 inches, and in the north-west of England it is as much as 5 inches. The systematic records of bright sunshine are not available before 1881, but since that date there has not been so dull a year as the present, considering the British Islands as a whole, and the difference is still more striking if we consider the eastern, or principal wheat-producing districts, the present year having less sunshine by 130 hours than any previous year, and upwards of 300 hours less than the corresponding nine months last year."

In view of these circumstances it has seemed that an inquiry might be usefully made, on behalf of the readers of this Journal, of representative agriculturists farming within the districts chiefly covered by the Society's operations, the aim of which should be to gather any hints, especially with reference to the hay-crops, which the experience of the year might suggest. The following brief schedule of questions was accordingly circulated among some 150 gentlemen, the names being selected chiefly from the Society's list of members:—

As to the Hay Crop.

1. What proportion of grass were you able to make into serviceable hay, and what was its condition generally?

2. Do you consider that the ordinary mode of haymaking in your district can be usefully modified in a wet season? If so, kindly explain in what respect.

3. Did you make silage of any of your grass? If so, kindly give particulars—viz.: as to date of cutting, length of time before ensiled, when "pitted" or "stacked," mode of pressure, control of temperature, probable results, &c.

4. Have you made silage of any crops other than meadow grass? If so, kindly give details.

5. What is your opinion as to the value of ensilage as a resource in wet seasons?

As to other Crops.

6. What effect generally had the wet summer upon the growth and yield of corn and other crops?

As to Live Stock.

7. Was the health of stock affected by any cause attributable to the continued wet? If so, kindly give particulars, and state any precaution or protection adopted by you, or suggested for the future.

The inquiry was, as has been said, intended to be limited to the South and West of England, and, with only two or three exceptions, to be noted hereafter, this principle was strictly adhered to.

It is not needful to dwell upon the evident advantages of the method of collecting at first hand the direct expressions of expert opinion in preference to a more general, or a more literary, mode of putting facts before the public. The aim was especially to obtain the teachings of experience, and this, so far as they go, the answers set forth below unquestionably give. Before proceeding to quote from the communications received, it may be desirable to see, from a statistical point of view, as nearly as possible, what were the general meteorological characteristics of the past summer. The following table (p. 138), compiled from the Reports issued by the Meteorological Office, shows the amount of rainfall and sunshine for each of the four months June—September. The figures given are the mean of the Official Returns for the two districts designated "South" and "South-West" England respectively.*

It is regrettable that there are no available figures for instituting a comparison for each month with the returns for the same months in previous years. The nearest approach which can be made to a useful comparison is in the following brief

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* The stations at which observations are taken are as follows:—*England, S.* (District No. 5.)—London (Kew, Bunhill Row, and Victoria Street), Strathfield, Turgiss, Dungeness, Hastings (St. Leonards), Southampton, Hurst Castle, Stowell. *England, S.W.* (District No. 8.)—Llandovery, Pembroke, Arlington (N. Devon), Cullompton, Falmouth, Plymouth, Prawle Point.

	Rainfall.		Bright Sunshine.	
	No. of days.	Amount in inches.	No. of hours.	Percentage of possible duration.
June	21	3·94	182	32
July	21	4·28	111	25
August	15	2·13	150	37
September	14	3·8	185	42
Monthly mean ..	18	3·36	157	34

statement, which covers the half year ending on September 30. The mean rainfall and temperature (in the South and West of England) for each quarter is placed alongside the mean for the corresponding quarters of the twenty-three years 1866–88.

	Rainfall.		Temperature.	
	1888.	Mean of 1866–88.	1888.	Mean of 1866–88.
	inches.	inches.	degrees.	degrees.
April, May, June	6·9	6·3	51·0	52·5
July, August, September	9·5	9·4	57·4	59·8

The characteristics of the season are here fairly shown. The amount of rainfall barely exceeded the average, but there was an appreciable falling off in the mean temperature. There is all the difference, as every farmer realises, between a cold persistent drizzle, and a few periodical showers or thunderstorms. And this was, generally speaking, the difference between the haymaking season of last year and a normal one.

The most convenient arrangement to adopt in setting forth the replies with which I have been favoured will be to divide them under the four subjects with which the inquiry assumes to deal. This will necessitate a certain amount of repetition of names, as a considerable number of correspondents have kindly answered all the questions. At the same time it will also permit of some compression where the answers on particular subject are simple negatives or where they do not add to what is elsewhere said. To avoid the needless repetition of addresses, I have added a full list of my correspondents in an appendix to the article, and have merely given against each reply the name and the county. This course has perhaps its objections, but it will probably be found on the whole preferable to the usual mode of giving all the replies in bulk, and so mixing up the various subjects to which they refer.

HAYMAKING.

The first section of the inquiry—*i.e.*, the first five questions—dealt with what was in fact its main subject, viz., the means adopted for saving the crop of grass. This naturally divides itself into two parts—Haymaking and Ensilage. With reference to the system of making hay in the west and south, one could not fail to be impressed in travelling through various counties during June and July with the wide breadths of meadow which had been cut, and the crop left for days and weeks in the swathe in a spirit of apparently hopeless resignation. Nothing is more unfair to farmers, perhaps, than what may be termed "railway carriage criticism." There are often local circumstances of which the passer-by is entirely unconscious, but which in all probability are sufficient to utterly vitiate his hasty judgment. Nevertheless the policy of "masterly inactivity" adopted by many farmers with reference to their grass during the past summer could not fail to strike the ordinary observer as a somewhat feeble one. There seemed to be a lack of resourcefulness and alertness in the face of what were no doubt serious difficulties. Endurance is, we all know, a grand English virtue. Farmers have sufficiently—we may well say nobly—shown their possession of it during the past decade. But every virtue has its corresponding vice. May it not be said that sometimes endurance may be exaggerated into stolidity? To sit down helplessly and despairingly when something may possibly be done to confront misfortune is not true endurance. It is with this idea that the opinions of practical men have been sought. It will be seen that many of them believe—and practise—the principle that the effects of the weather may be contended with, and that modifications in the methods adapted for an average season may be made when an exceptional season occurs.

It was perhaps the fault of the inquirer that many of the correspondents did not catch the drift—so to speak—of the second question, but took it to refer to ensilage. Where such is the case, I have taken over the answer, or a part of it, to the next section of this paper.

The replies dealing with questions 1 and 2 (*vide* p. 137) were as follows:—

BERKS.

Mr. T. J. Bowles:—

1. 30 acres out of 50 put up for hay in first-rate condition. 20 acres took a lot of wet, but it was dressed with salt and sugar, and cart-horses are eating it well.

2. Yes, by taking a leaf out of the Welsh and Northern farmers' books,

and being careful always to cock hay in fair-sized cocks in catchy weather, putting two cocks into one if weather continues bad, and, where hay is cut by machinery, being careful not to cut down too much at once. Apparatus for making silage should be kept in reserve, as grass cannot always be kept standing too long.

Mr. T. Latham :—

1. Very little, indeed, but as our system is to keep our hay in cock almost as soon as it is cut, we were more fortunate than some people.

The general condition is, no doubt, much deteriorated by the absence of sun, and the great amount of water.

2. No.

Mr. H. Simmons :—

1. We commenced cutting grass the last week in June. Our haymaking at Bearwood, in consequence of much of our land being laid down to permanent pasture, is a heavy undertaking, and in a season like the past one calculated to try the patience and temper. We made about 600 tons of hay, and, speaking roughly, half of that quantity—that made at the commencement—was more or less damaged by wet. At the same time we finished it well, and I am glad to find the ricks have gone together, and cut out clean and better hay than I had anticipated. The remaining half, from the fact of our discontinuing mowing for three weeks till the fine weather set in, and then starting seven mowing machines, is good hay, well-secured, and all fit for the market. Although so late in cutting, the grass was young and growing at bottom, and the quality of the hay is satisfactory. We also made two ricks of good aftermath mixture. It has been stated that you cannot easily make *hot* hay-ricks late in August. I proved this to be a fallacy, as two of our last-made meadow stacks got very hot, indeed, and but for some little attention, would have given trouble. The middle of these stacks will be very dark, but we think will answer a most excellent purpose for mixing with some of the hay made unsavoury by taking wet. The tendency to heat in many of our stacks showed that the grass had retained strength and virtue.

2. I think in a wet season much may be done by altering our plans, and when we get a season like the past, a month late, it is a mistake to cut down a great breadth of grass, because it is the usual time for haymaking, good weather or bad. One or two of my neighbours followed out this plan, and ended by the whole crop being entirely spoilt, and mostly uneatable. Those who waited this year were repaid for doing so. By cutting less at one time, and keeping it in large cocks in the field after the system followed in other countries where the climate is bad generally, a great quantity of hay was saved from material damage, and retained its smell and colour. In my vocation as a valuer, this Michaelmas, this fact has struck me very forcibly. I go to one farm and find 8 or 10 ricks of hay, 2 of them were mere dung-heaps, not even thatched; 4 or 5 others when cut all streaked with mildew and almost useless, the rest useful hay. At another farm I find perhaps the same quantity, and am surprised to find it on the whole fairly well ... in a great measure, owing to more careful management and patience.

M... Richard Todd :—

1. The continuous wet weather ruined a great quantity of hay in this neighbourhood, and what was carried, in some instances, can be of little, if any, value for feeding purposes. In my opinion only half of the grass and clovers was made into serviceable hay.

2. I do not think the mode of haymaking in this district can be altered for the better in a wet season.

DEVON.

Mr. Evan Baillie :—

1. Made larger proportion than usual, owing to all old hay having been consumed. The earliest cut saved well, the next injured by rain, the last well-saved, but over-grown.

Mr. Vincent P. Calmady :—

1. Out of nearly 100 acres of grass cut, I was able to make about 60 acres into serviceable hay. The rest was much damaged. At the same time I must add that I do not consider any of the hay in my part of the country is of good quality, owing to the time at which it was cut—so very late, that all the seeds had shed. I never recollect such an extraordinary quantity of seed to germinate amongst the old grass as there was this year. Nor do I ever recollect such a small quantity of white clover blossom in the aftermath—scarcely a blossom to be seen in any field, although there is an abundance of plant in our pastures. Nor did the second cut of clover in seed fields come to any length at all, but was generally a very slight crop.

2. Very little trouble is taken in the making of hay in my district, as it is never half turned or worked with the haymaking machine. In that respect it might be much improved.

Mr. R. H. Lipscombe :—

1. I am of opinion that not 20 per cent. of the hay made this season in Devonshire was sweet and good, and I suspect that nearly half of the remainder must be nearly entirely devoid of nutriment; the remainder was what I should call "serviceable" hay, but not such as a stud groom would put up with. One district came off worse than another, but I can say confidently that the hay between Exeter and Crediton was out for a month, and was almost entirely spoilt. No skill could have saved it.

2. I consider that Devonshire people, as a rule, set about their haymaking on the assumption that the weather is going to be fine, and that the system of haymaking which they adopt can only produce second-rate hay if the weather is at all showery. I spent my youth in the North Riding of Yorkshire and in Northumberland, when cocking was not sufficiently practised, and where gathering the hay into wind-rows, sweeping the rows up with horses, and putting the hay into "pikes" containing half a ton apiece or more, was the fashion. In Northumberland these pikes were often allowed to remain for weeks in the hayfield, and a proper second sweating in the haystack could scarcely be expected to follow. I saw haymaking done to perfection, in my opinion, in the extreme West Riding and in Westmoreland, when the system was as follows: All grass cut up to 12 o'clock was spread *by hand* on the day of cutting, all lumps of grass being carefully shaken out, and, before nightfall, all that had been shaken out was put into small foot cocks, and under no circumstances was hay ever allowed to lie spread abroad through the night. As soon as the dew was off on the second day, the foot cocks were again spread out *by hand*, and the whole formed into larger cocks before nightfall, and so on until fit to go to the stack, but the larger cocks were made in a masterly manner, the maker shaking each forkful on to the rising cone until a point was reached, and the amount of rain which one of these well-made and well-trimmed cocks would throw off themselves was astonishing. I never saw a "pike" in that district, and the rainfall there is a very high one. I have never seen a haycock really well made in Devonshire, but I feel bound to add, that if half-made hay is put into cock in the Westmoreland fashion in Devonshire it will not turn out in anything like the condition of a Westmoreland cock, because, I presume, of the dampness and softness of the air.

Mr. W. Stevens :—

1. We were fortunate to make just 90 acres of good hay—about 30 acres by "pooking," or "cocking," and 60 acres cut late. The latter was (some of it) a little sanded by floods.

2. Yes. There is not sufficient care taken in pooking hay. I consider that hay *well pooked* (not heaped together) will stand almost any amount of rain. I am a great advocate for pooking hay, especially in wet weather. The size of the pook to be governed by the condition of the hay; *e.g.*, if the hay has been cut, say, two days, and has become nearly half dried, it may be put into pooks about 5 feet diameter at bottom, and carried up in conical shape to about 5 or 6 feet high. If the hay is three parts dried the pooks may be made somewhat larger, and if nearly dry can be made 8 or 9 feet in diameter at bottom, and 8 or 10 feet high. From bottom to top the pook should always retain the form of a cone, and if this is attended to, the rain can only penetrate a few inches beneath the surface. Care should be taken in stroking down the outside loose hay, and in pulling out the loose hay at the bottom of the pook.

Hay three parts dried, well pooked, will stand torrents of rain, and, moreover, will make itself sufficiently dry to cart from pook to stack without again being spread over the ground. I have seen hundreds of acres of partially dried hay thrown into mere heaps in a most slovenly manner, the rain soaking from top to bottom, and doing its best to rot the whole. It is this kind of (what some people call) pooking hay which brings the system into disfavour.

I may mention that this season Sir T. D. Acland had a 30-acre field of late trifolium and clover put into large pooks, and when the men had completed their work I told them I was pleased at seeing the field so well pooked, and that I did not much care what the weather might be, little thinking at the time that we should have such torrents of rain. When these pooks were opened, many were surprised to see how little the rain had damaged the hay.

Dorset.

Mr. E. W. Williams :—

1. None. Bad.
2. No.

Gloucestershire.

Captain Byng :—

1. About 16 acres of grass made into hay, in very good condition; got in before very much rain fell.

Mr. Hobbs :—

1. Three-fourths much damaged, but fairly well ended; the remainder made right, but too late in season for prime hay.

2. My experience has taught me that hay must be carried free from water-wet to be at all serviceable. All my stained hay had a mixture of salt sown amongst it when being placed in rick.

Mr. E. W. Trinder :—

1. I mowed 35 acres of seeds and sainfoin, 14 acres of which was almost entirely spoiled. I also cut 53 acres of pasture; of this 10 acres was com-

pletely spoiled. All the rest I harvested fairly well. I am fortunately well provided with Dutch barn room, and was thus able to pick up a few loads at a time, and by laying the rick wide open was able to carry it sooner than I otherwise could. On the whole it cuts out better than expected.

2. I do not see how haymaking can be managed differently. The alternative is either silage or hay. I am, however, greatly in favour of cutting the grass as early as possible; by waiting for a heavier crop there is a decided loss in quality. I think barns are very valuable, and particularly in a wet season.

Mr. G. Whitcombe :—

1. I made about half my grass into serviceable hay.

2. I consider haymaking can, in my district, be usefully assisted by silage.

HAMPSHIRE.

Mr. J. Barton:

1. A very small proportion of 130 acres of grass cut, and that of an indifferent quality.

Rev. J. G. S. Nichol :—

1. My hay was out just a fortnight. It is fairly serviceable. All meadow. Cut middle of July.

2. I do not think there is any practicable modification.

Mr. T. Stirton :—

1. The proportion of grass and clover made into hay would be about 70 tons, but a great part of this was worthless and quite unfit for fodder, from long exposure to the weather.

2. Yes. I consider that too much grass is cut down at one time, irrespective of the weather, and that in a wet season farmers might benefit more by cutting a less quantity, so as not to run the risk of losing all their hay crop. Another means would be to convert it at once into ensilage.

HEREFORD.

Mr. T. Charles :—

1. About one-third of my grass was made into hay; the greater part was much damaged by rain.

KENT.

Mr. J. Kirkpatrick :—

1. The first half of my hay was got in with some difficulty in a state fit for tolerable fodder; the other in as good a condition as I could wish it to be. It was begun later than usual, on the 12th July, and the making lasted to the 24th August—6 weeks, 1 day—for about 100 acres. We always begin late—generally about 1st July—as the ewes (about 800) are only taken off the pastures at the end of March or later. I do not like it, as we sometimes fall under the unkind influence of St. Swithin, but he was in better temper this year. The long making time is of course expensive, and hinders other labour on turnips, &c.

2. I do not think we can modify our mode of haymaking in any way, unless by making large cocks. Last year we made none.

Mr. H. Rigden :—

1. One-third serviceable hay. The remainder nearly spoilt.

2. We have a small labour supply, and very dear. Hay is made by machinery and horse labour—all but carrying and stacking. We don't silage any in this district.

Mr. W. L. Wigan :—

1. Only one stack opened at present. From its appearance I should say that the whole will be serviceable. There are a few tons of first-rate hay, and a few patches of mould. The bulk is good hay, but without aroma or brightness. I am selling this to a dealer at 5*l.* 10*s.*

2. Only by constant attention, and preventing the crop, when cut, from being beaten down and matted on the ground. My land is light, and my crop not much over a ton, so that it is easier for me to keep it mowed than it is for many. In showery seasons big cocks would no doubt be useful, but not in such a season as the past, in which the grass had to be cut with the rain on it.

*———— :—

1. Only about one-fourth, and that too old to be good.

2. In wet seasons more cocking would be useful, in preventing washing, &c. We don't cock at all in fine seasons.

MONMOUTH.

Mr. R. Stratton :—

1. About one-third of my hay was utterly spoiled, and is worthless excepting for litter; the remainder ranges between, perhaps, one-third good, one-third fair, one-third very indifferent.

2. I think the system of putting hay into "wind-cocks" might with advantage be more generally adopted when the hay is about half made; and where hands are available, it should be got into small cocks sooner than is generally the case. Beyond this I can suggest nothing.

OXON.

Mr. St. John L. Clowes :—

1. Our clover hay was entirely spoilt by the wet this summer, and is not worth as much as straw. Fortunately, owing to the large crop of clover hay saved in 1887, we had several old seed ricks, and by mixing the new and old together, our sheep and horses eat all up well.

Our meadow hay was a large crop, and we succeeded in saving more than half in very good condition, which will well repay the extra amount of labour bestowed on it. It has taken a good heat, and is very sweet.

SOMERSET.

Mr. J. S. Bult :—

1. One-fou th, and very inferior.

2. N.

[illegible] ary :—

1. Above two-thirds: this was good hay, the remaining third being more or less damaged; but to make this proportion of good hay, I must tell you, I

* Reply received without name.

did not cut any grass for some weeks during the continual rain. I have a lot of machines of all kinds, and during the fortnight's fine weather we got in a large quantity of hay. I cut above 340 acres.

2. I cannot see how the ordinary mode of haymaking could be improved, except by making, in a wet season, more ensilage.

Mr. J. Kidner :—

1. No really prime hay, but 60 acres good enough for fatting bullocks to do well on, and 40 acres which young bullocks will eat without waste. Five acres good for nothing.

I consider myself fortunate in saving so large a proportion of useful hay. By cocking when three parts dry of sap (no water), 40 acres were carefully cocked and not touched for a fortnight, then turned over the first fine day, next day thrown abroad, turned, and carried in first-rate order, with still sap enough left in it to make it a nice brown uniform colour—20 acres each day. Other 40 acres were cocked a few days later, and not quite so well done, and the cocks turned twice in the fortnight. This not very satisfactory, but very much better than wasted. I consider hay that would come to carry next day, if fine, pays well for cocking in the evening.

Mr. E. H. Llewellyn :—

1. The grass cut late was a very heavy crop, but I would sooner have had the after grass to feed. Very little of the hay made about here was *really good*. Nearly all had to be dried more than once. A great deal was out for weeks, and as a consequence was worth little when secured, all the goodness having been washed out. Personally, I made about 40 tons of good out of 130 tons. All depended on the time chosen to cut. I had mine "about" for over two months.

2. I cannot suggest any way of altering the present system of haymaking.

Sir R. H. Paget, Bart., M.P. :—

1. All serviceable; two-thirds good.
2. No.

Captain J. D. Sherston :—

1. We estimate that we made 54 a. 1 r. 6 p. *best* hay fit for milk beasts, 47 a. 1 r. 2 p. of *good* hay for store cattle, and 17 a. 0 r. 1 p. of inferior hay fit only for store cattle, but even that I see is freely eaten by the cattle.

2. The employment of more labour and generally following the old system of cocking hay when nearly fit to carry is the only suggestion I can offer for managing grass in a wet season. I had to employ more *constant* hands than usual and several occasional extra men, as masons and other artizans, on fine evenings after their usual hours.

Mr. G. Wright :—

1. Out of 100 acres of meadow I am glad to say I made 60 acres serviceable hay, 30 acres first quality, and 10 acres very bad. I may add I was more fortunate than my neighbours, by having a larger staff of workmen at my command.

2. I do not consider the ordinary mode practised in this neighbourhood can be modified. Grass is all cut by machine, worked by hay tedders, and the greater bulk stacked in the fields; raked in rows by horse-rakes, and collected by the collectors on hay-forks to the ricks. One man, one boy, and one horse can pull together as much as 8 to 10 acres of a fair crop per day. Elevators I see are being more used this season, which is a *great*

saving of labour where large and high ricks are made. Of course they are only used by large farmers, the cost being too great for small ones, but I should advocate for two or three small ones to combine, the saving of labour being so great.

Surrey.

Mr. W. Goodchild :—

1. Owing to the wet season all the grass was rather old before being made into hay, still not more than 12 acres out of some 80 acres were spoiled. By cutting just as much at one time as we could manage, and cutting no more till our way was fairly cleared before us, we were able to secure most in a fair condition. Our clover or seed hay was almost ruined by continuous wet weather. Carting it off green half made in such a season is unadvisable, owing to the injury which would accrue to the second crop.

2. With the exception of being more careful as to quantity cut down before any is cleared in a wet year or hazardous season, I do not see that our system of making hay can be modified to advantage.

Sussex.

Mr. T. A. Abbott :—

1. We began cutting grass for hay on the 25th of June. The crop was an unusually large one, and was computed at about 2 tons per acre upon about 200 acres. Our first cutting was the earliest grass which ripened in this high-lying district, and owing to the wet weather got very much damaged. From this time, the weather being still unsettled, we cut no more till the 10th of July. The grass of this cutting was kept in cock with occasional removals for six days; the weather still continuing bad, we, by way of experiment, commenced putting it in a silo. After this we got no hay until the weather cleared in August; by this time the grass and clovers had largely shed their seeds, which had germinated, and a second crop had grown through the whitened seed stems of the first crop, so that practically we cut two crops—grass and aftermath together. I consider the feeding value very inferior. It will be useful for store stock, but probably has less nutriment in it than good oat straw. Its actual weight compared with its bulk very light.

2. The ordinary method of making hay in this district I consider very defective, cocking or putting the withered grass into compact heaps not being generally practised. In fine seasons I consider the excessive exposure to sun and wind is wasteful, but much more so in a wet one. Many farmers in this district consider hay which has been fermented in the rick and become brown to be more valuable than green hay. In this matter I think they have something to learn.

Aylesbury Dairy Company :—

1. We had 500 acres of grass to cut; of this about 350 acres were made into serviceable hay, some of it very good; 70 acres were made into stack silage on the "Johnson" system, and the remainder into inferior hay.

2. No.

Mr. W. Jordan :—

The greater part of the hay crop was carried in good condition as usual.

Mr. Charles Liddelly :—

31 acres of meadow grass, some good, all serviceable and fairly good. [illegible] of marshland grass serviceable, but 16 acres much damaged by the

floods from uplands. 6 acres of seeds, intended for threshing out, but obliged to be cut in consequence of wet—over-ripe but serviceable hay. 8 acres of tares, the same as last, and part good.

2. I consider that in this district people count too much on continuous fine weather. For instance, after a fine day, when the hay has been tossed and spread and is nearly ready for carrying, and with rain threatening, they leave it spread instead of putting it up in cocks or wind-rows, and if rain comes in the night, it is thoroughly soaked, and the ground is kept wet, as the wind and sun cannot get to it, and much longer time and labour is required to dry the hay again.

Mr. W. Woodley :—

1. Mowed about 70 acres of grass, 50 of which was made good for the season (say second quality), and the remainder could be used among the store cattle.

2. Cut down smaller quantity at a time, and put into cock sooner.

WILTS.

Mr. Charles Burbidge :—

1. Very expensive work, yet all is made serviceable, and will be eaten with relish in the winter months, especially when salt or other condiments were used in stacking.

2. To a great extent in this neighbourhood the grasses are artificial, and I consider the ordinary mode of haymaking cannot be improved upon.

Mr. E. Burbidge :—

1. Made about half clover into very serviceable hay; also half of pasture, but it was overgrown, and could not be called good hay.

Messrs. C. and T. Coles :—

1. We made no hay without rain; about 50 tons were made in fair condition, though old when cut, through waiting for fine weather; the rest (about 150 tons) is very much damaged, though some Italian rye-grass that was very bad (but cut young) our sheep eat well, although they have plenty of grass and roots.

2. Slightly. We noticed that hay spoiled quicker when horse-raked into rows, than in swathes, or hand-raked rows, and kept much best in cocks. The best plan appears to us to be, in wet seasons, to cut small quantities, attend to them immediately weather permits, and to cock all nearly dry hay at the end of the day. For chaff, you can occasionally make some good fodder by mixing (if you have a stack of sweet straw near) straw and partially dried grass, in proportion as condition of grass permits, whereas were the grass allowed to stay until thoroughly dried it might be spoiled.

Professor W. J. Malden :—

1. About an average quantity of grass laid down for hay; the quality made was very poor, in fact much of it was only about as good as the tops and bottoms of stacks usually are. It is not so bad that it cannot be consumed, and doubtless with steaming may be made palateable, but it will be extremely poor food, and most of it is practically unsalable. It is the worst got crop of hay I can remember, not excepting 1879, when part of that in which I was interested swam away, but the rest was got in better condition. The clover hay was worse got than the grass, if possible, without being absolutely spoiled.

2. There was no chance of getting the clover in better condition, on account of the difficulty of handling it, but the grass might have been saved in better condition had more care been taken with it. I was continually through the grass districts in Middlesex and Herts, and badly as they may have got theirs, there is no doubt but that they were repaid for the extra labour bestowed upon it. As a rule no effort is made to get it in "hand" in this neighbourhood, but it is left to itself either in the sward or tedded out, but rarely if ever put in the cock. If the same attention and skill were bestowed upon it that the Middlesex men—who chiefly rely on their hay—give to theirs, I feel confident that there would have been much more useful hay about. I do not think that there was a chance of making first-class hay, but most of it might have been saved in very much better condition than it was.

Mr. F. R. Moore :—

1. None. Very bad.
2. No.

Mr. William Stratton :—

1. The only serviceable hay I made was in August, when I got about one-third of my crop in good condition. This had been fed to stock till late in the spring, some of it until June 10th. It is my usual practice to feed some portion of the mowing land in the spring, so that I may not have all my eggs in the same basket!
2. No.

Isle of Wight.

Mr. Cecil B. Dixon :—

1. Half serviceable; about one-fourth good; remainder only fit for litter.

Wales.

Captain Best, R.N.* :—

1. I was able to make about two-thirds of my grass into serviceable hay. Grand crops. Those who cut late did well, and *vice versâ*.

Mr. Herbert Lloyd :—

1. I made serviceable hay of about half my crop. The rest was damaged more or less by the bad weather. I carried about 3 acres to the dunghill.

Mr. J. N. Trayler :—

1. With exceptional care and labour I saved most of mine in fair condition, but a large quantity was damaged in this locality.
2. Yes. By following the Irish system of making it into small heaps next day after mowing, and if weather afterwards prove wet, of lightly lifting the grass with pikes during intervals between the showers. Time might be saved, and risk of fire lessened, by making ricks in the field, instead of carting all into hay-guard.

In addition to the above replies, which refer to the West and South of England and Wales, I have been favoured by Mr.

* Writing on November 4th, Captain Best noted the rainfall as follows:—1887, 25·52 inches; 1888, 25·93 inches.

H. A. Howman with some valuable notes, from which the following extract comes under this part of the subject:—

2. The plan of haymaking in this country is to leave the hay tedded about until ready for carrying, exposed to all sun and dews, with the result of deteriorated quality if the season is fine; but if wet, they put it into foot cocks (probably a local term) too small to be of much use, as the heavy rain goes through them. My practice is to put the grass (though green, but *dry*) into large cocks, so that they have body enough to stand rain for a considerable time, when well made. Then when the weather breaks up they are opened, and the making completed. In dripping weather only enough are thrown about that can be carted in the day.

It is not needful to add anything to the views which have been so well expressed in many of the above communications. There is sufficient evidence that many competent farmers believe that greater pains might profitably be taken in a wet haying time. Mr. W. Stevens describes very clearly a system which may well be commended to the attention of Devonshire farmers, and probably of farmers in other counties where the summer sun is unreliable. The advantages of some careful systematic method of pooking or cocking the hay in "catchy" weather are recognised in many of the communications. Reference might be made specially to the recommendations of Messrs. Lipscombe, R. Stratton, Kidner, Liddelly, Latham, Malden, Coles, and Howman on this point. They amply suffice to justify the opinion expressed at the outset, that something may be done, even under the most unfavourable conditions, to mitigate misfortune by those who are alert. Mr. Trinder, it will be observed, advises that grass should always be cut early, while Mr. W. Stratton suggests—with regard to a part of the crop at least—an opposite policy. One or two correspondents, among them Messrs. Simmons, Stirton, and Goodchild, allude to the risk of getting too much of the grass down at once. Mr. Calmady mentions the lack of white clover in the hay crop last year. This is a point which was subsequently referred to by Sir John Lawes as a characteristic of the season.

One remark may perhaps be ventured upon with reference to the report found in many of the replies, that the inferior hay was given to store stock. This is no doubt a convenient mode of utilising it, but the tone of some of the replies induces the idea that it is not always quite appreciated how practically worthless in feeding value is hay which has long been soaked. Of course its inferiority is recognised, but inasmuch as the stock eat it, it is possible that the wastefulness of obtaining such stuff, often at considerable expense, is not always adequately realised. To put it another way: it may fairly be said that moderately good silage from fresh-cut fodder contains much more nutriment

than the washed-out, effete hay of which so many tons have this season been fed to stock.

ENSILAGE.

It is some five or six years since the system of ensilage was introduced into this country. Although it has spread to a considerable extent throughout the United Kingdom, it cannot be said that its progress has been, up to the present year, rapid. It was for some time hampered by the fact that the cost of erecting silos made it rather a landlord's or gentleman farmer's question than a tenant farmer's. A year or two ago the introduction of the "stack" process gave a sudden impetus to the movement, and brought it for the first time—so far as the majority of farmers were concerned—within the range of practical farm politics. On the 1st of June last there were 2667 silos in Great Britain, and 1275 persons had intimated their intention of making ensilage in stacks. These figures were practically the same as those of twelve months previous. Nor on the 1st of June did there seem to be any reason to anticipate that the system would make any sudden headway. A few weeks' rain, however, made a wonderful difference. Many who had not before thought of ensilage, or had thought of it only to scoff, became hastily inquisitive about it. Ensilage stacks, more or less carefully constructed, dotted the country. An attitude of indifference or contempt was suddenly changed to one of enquiry and enterprise, and for a few weeks silage was the absorbing question of the field and market-place.

It is a curious anomaly that this silage spasm, so to speak, leaves no trace upon the official records of agriculture. Not one of the stacks, which were thus hurriedly erected, was contemplated when the Agricultural Returns were last collected; not one, in all probability, will be left when the time of statistical stock-taking comes round again. No doubt many of those who made silage in a pinch will adopt it as a practice, and thus "the number of persons proposing to make stacks" next year should be augmented. But of the actual movement which so widely affected agriculturists in the summer no record will remain.

It cannot but be fitting, therefore, that the pages of this Journal' should contain some account of the experience during the past year of those who in various ways saved their crops by means of ensilage. The following communications exhibit a wide diversity of detail, and afford material from which any student of the subject may probably gather useful hints.

The bulk of the replies are, as aforesaid, from farmers in the West and South. Three communications have, however, been

received from gentlemen outside the district, for neither of which, however, is any apology needed. They are from practical authorities on the subject, to whom the present writer ventured to appeal, and to whom he is extremely indebted for their kindness in responding to his enquiries. To the Master of Rothamsted especial thanks are due—thanks in which readers will join the writer—for his weighty words. The time and talents of Sir John Lawes may almost be said to be public property, so unfailingly ready is he to devote them to any one who asks his aid in the name of agricultural research.

The questions which come under this section of the subject are Nos. 2 (in some cases), 3, 4 and 5 (*vide* p. 137).

Sir J. B. Lawes, Bart., LL.D., F.R.S. :—

2. I certainly think that silage can be made with advantage in such a season as 1888. It was impossible to make good clover hay, and according to my experience, clover and other leguminous crops make better silage than grass. There is certainly more loss of food material in a stack than in a silo, but I should not advise farmers in my district to incur the expense of a silo, or to pay rent to their landlord for his outlay, as I am not favourable to silage when good hay can be made.

3 and 4. Pasture grass, oats, red clover, a mixture of oats, beans, peas, tares, sown together. Well-made oat silage was greatly inferior in feeding properties to the ripe crop cut into chaff and fed by oxen. Hay silage did not give such good results as clover silage, and there appeared to be more loss of food material in the grass than in the clover. Those who wish to grow a special silage crop on arable land cannot do better than sow the mixture of seeds I have named: one bushel of peas, one of beans, one of oats, one of tares per acre.

Very careful experiments have been carried on by us with pasture grass made into hay and into silage, the main object of the investigation being to ascertain (1) the loss of food material in the silo and in the haystack, and (2) the feeding properties of silage and hay. It was intended to have made the grass into sweet silage, but in order to obtain the necessary temperature in the silo, the operation of filling must be suspended for several days, this exposing the grass to injury by rain; the attempt was therefore given up, and the grass cut for hay, and placed in the silo, was operated upon in exactly parallel condition. It appears to us that making sweet silage, however desirable it may be for some reasons, can never be carried out by practical farmers on account of the great disturbance to the labour of the farm. When a field is fit to cut, it is desirable to fill the silo as quickly as possible, and to bring all the strength of the farm to bear on the operation; if, however, after a few hours' work everything is brought to a standstill for some days until the temperature is risen to the necessary height, and the same stoppage takes place several times, the cost of making silage will be greatly increased.* Sweet silage was strongly advocated some years ago, but we have heard very little about it of late years. About 40 tons of grass were chaffed and weighed into the silo: the whole was weighed out as required; the amount of dry matter lost during fermentation was not quite 19 per cent. The loss of dry matter of the grass when made into hay amounted to 7 per cent.; this loss

* Sir John, as will be observed, refers to the difficulty and delay of making "sweet" silage in a silo. There is neither difficulty nor delay in making it in a stack.

is larger than we have obtained in other experiments in haymaking, but the loss of dry matter in the grass silage is not more than we have obtained in other experiments, and this loss would probably be considerably exceeded where silage is made in stacks. In the experiments with feeding, oxen were used; they received equal amounts of artificial food; one lot received grass silage *ad libitum*, and the other lot hay *ad libitum*. For an equal amount of dry substance consumed in the hay and silage, the amount of increase obtained in the oxen was almost the same; or, in other words, 100 parts of the dry substance in the silage gave as much increase of animal as 100 parts of dry substance in hay. But the loss of the dry substance of the grass during the process of haymaking was only 7 per cent., while the loss of silage-making was 18·8 per cent., leaving a difference of 11·8 per cent. in favour of the hay. It may be observed that the hay was made under favourable conditions in regard to weather.

5. Decidedly valuable when good hay cannot be made.

Mr. Henry A. Howman :—

3. I make silage of most of my grass, beginning when the grasses are in flower. I prefer a certain age in the grass. I don't like siloing young succulent stuff. I let the grass lie in swathe for a certain time, depending upon the weather, so that a little of the moisture shall be evaporated before siloing. I chaff it before putting into the silo, and press with a home-made lever. I am using my silage made this year, and it comes out very good, semi-sweet.

4. Clover and rye-grass, which to my mind give the best result of any crop. I put all my siloing out to contract at per acre—to cut the crop, cart, pass through the chaff-cutter, and fill the silo.

5. I have on this farm of 230 acres 12 silos holding from 30 to 40 tons each, and from an experience of several years I wouldn't be without silage whatever the season is, and in a wet season, such as the last, it is most invaluable.

Mr. John Bateman * :—

3. Twenty-five acres. Cut June 20—July 3. Carted straight off. Reynold's system of pressure used.

4. In former years maize—about 25 acres; this year it was a failure.

5. Very useful.

BERKS.

Mr. T. J. Bowles :—

3 and 4. Yes, of grass, and 9 acres of clover full of shed wheat. June and July: Mostly cut and carried the same or following day. September: Lattermath grass and sainfoin and second crop clover; most of this lay two days, was not so succulent, and, as at present advised, will not be quite so good as the first stack. Both lots are in stacks 15 feet by 12 feet by 12 feet high when fully pressed. The apparatus used is Reynold's, of Acorn Works, Southwark; in my opinion the best I have seen for all ordinary purposes, consisting of long chains anchored under the stack in "beams" or "lugs" of wood, rough, let up over beams, with iron cogged pulley wheels fitting into iron brackets, the beams placed transversely over stiff planks, which need not be touching; the ends of the chains are fastened to a screw-jack, and a very high pressure is the result, and can be worked by one intelligent man. A thermometer is supplied in an iron rod, and the temperature can be regulated by the pressure. The silage cuts out beautifully, and there is not

* Mr. Bateman was the first to introduce the system of making silage in "clamps," but he does not appear to have adopted it this season.—R. H. R.

much waste. Price of iron parts of apparatus, chains, pins, &c., and thermometer, delivered, 12*l*.

5. Personally, I consider it of great value in wet seasons, and would always have the means of making silage at hand; but, except on a farm where there was a lot of rough stuff and odds and ends, I would not make it in preference to good hay.

Mr. H. Simmons:—

3. We made a rick of silage on the Johnson system, and filled our silo, using in the silo as pressure old artificial manure bags filled with gravel. This we did in the wet weather during the three weeks' stoppage before mentioned (the end of July). We carted the grass into the silage the second day after cutting, preferring to cart it dry rather than wet; but some of it was wet when carried. We removed the pressure, and refilled the stack and silo, from time to time, till filled up sufficiently, and then put on the full pressure (thatching each stack), and so it remains, as we have not yet opened either. The stack we estimated at 35 tons; it certainly looks more like 15 now in bulk, having gone together so closely. I am in hopes both will turn out well, and intend using it in a way to test its merits as against hay.

4. I have only made silage of meadow grass, but have sold a crop of tares in a neighbouring county for silage; the tares were removed and made into a silage stack. The last time I saw it the juice was running out like Dublin stout, and I thought it looked unpromising, but the owner (a lady) was most hopeful. I shall hear another day the result of this also.

5. Ensilage, I believe, in a wet season can and will be made to good purpose, and even in a dry season, where straw and roots are scarce, will be found of great service. Carting grass, after being accustomed to make good hay, is heavy, uninteresting work, but once get men to realize its usefulness, and it will be much more generally done. I do not for a moment say in any way to take the place of hay, but as a good auxiliary.

DEVON.

Mr. W. J. Harris:—

2, 3. In one of my farms, called Ellacott, I have made this season 300 tons of ensilage and 60 tons of hay, from 70 acres of grass land, and not more than 8 tons of the whole have been injured by rain. I entirely attribute this result to making both ensilage and hay instead of hay alone. An acre of ensilaged grass is certainly not worth more than an acre of really good hay; but if I had two acres of grass I would rather have one made into ensilage and the other into hay, than have the whole made into one or the other. The making of ensilage materially assists the making of hay. During the past season, when the shears of grass have been very heavy, this has been eminently the case. I continued cutting all through the rainy weather, and the waggons followed the machines for the first few rounds, taking up everything within one or two landyards of the hedges, and thus saving what was so difficult to dry in catchy weather. If the rain continued, and in three or four days there seemed no chance of the weather improving, another start was made on the same field, and four or five swards were loaded for ensilage between the showers, while the adjoining four or five swards were left for hay. Then, in a further four or five days the whole remainder was taken for ensilage if the weather still remained too changeable for hay-making. Directly the weather turned fine there was, by this system, double the ground upon which to spread hay, and heavy crops could thus be saved as quickly as light ones. As regards the manufacture of ensilage, I believe my own plan of having no boards to cover it, and only applying pressure to the sides until the silo is quite full, is all that is needed. When the silo is full

I cover it with a load of rushes, and then put on some 6 to 10 inches of mould. The mould came in useful afterwards, as it came out as dry as dust, and could be used for drilling in artificial manures the next year. This more than paid the expense of carting it to the silo. In loading care should be taken to keep on adding weight every two or three days. If the silo contained 100 tons it must be quite evident that the one ton at the bottom supported the superincumbent weight of the 99 tons above it, and as the filling went on from day to day it was quite certain that before any could spoil it would have the required pressure in the superincumbent weight of the same material. The friction on the walls probably prevented the material exerting its full pressure, and that is why I from time to time put weights round the edges for say twenty-four hours, to get the sides down to the same level as the middle. Although I have made some stacks, I prefer silos. The waste in stacks is considerable, but when it becomes a question of having it in stacks or not having it at all, I decidedly recommend making it in stacks, and pressing it with one of the many inventions for the purpose. A stack requires more pressure than a silo.

Mr. R. H. Lipscomb:—

3, 4, 5. I can give you very little silage information, only one Rolle Estate tenant having done anything of any note, either in North or East Devon in that way. He made successful silage in his large straw house at the end of his barn, of a field of clover, building it up clear of the walls, covering it with planks with which I supplied him, and putting 15,000 bricks, which I lent to him, on the top, but although the silage was good, and although his cattle did well upon it, he has not repeated the process, nor has any other tenant made any proposal to me with regard to a silo, with one solitary exception, in spite of the recent wet season.

Mr. W. Stevens:—

3. Yes. We made a stack, commenced it on the 20th August, with some overripe meadow grass. It was carted to stack same day as cut. Most of it was cut and carried in wet weather. We generally waited about two days between each cutting and stacking. No pressure was put on at first, but on the sixth day after commencing the temperature rose to 160°. I then had some elm plank and large stones put on, which reduced the heat to 140°. It again gradually rose to 160°, when more pressure was applied.

Especial care was taken to well tread and press the outsides of stack so as to exclude air. Finished stack on the 22nd of September. The temperature rose higher than I wished, to 160°. I hope, however, that the ensilage will turn out good. Much of the grass was overripe. The stack remains weighted with stones, and is roofed with straw.

4. Yes—a second cut of clover grass.
5. Our first attempt: "The proof of the pudding is in the eating."

P. S. Jan. 22.—The pudding has been cooked, and served; and if we may judge by the appetite of the invited feeders, there can be no doubt about the acceptable character of the *pièce de résistance* put before some steers in their shed. Some was spread out on an open field, and quickly eaten up by young [illegible]

Gloucester.

Hon. Captain Byng.

2. Yes, by making silage.
3. No.
4. A stack was made of 3 acres of vetches, with 6 or 8 waggon loads of

rough grass and fern placed on top, the whole compressed by the chain pressure system of Messrs. Reynolds and Co. The stack has not yet been cut.

5. Very great value.

Mr. Hobbs:—

3. I made 17 acres of grass into silage the first week in August. Placed in a stack wet immediately after cutting. Pressed by means of drawing the loads upon the stack, and when too high for drawing up trodden by a horse. Wires were then thrown across the stack and weighted. Have no idea as to the result.

4. No.

5. Have had no experience.

Mr. E. W. Trinder:—

3. I have not made any grass into silage on my own farm.

4. I made a silage stack this year of 20 acres of spring vetches. It was made at intervals of a day or so between each storing. I used Thompson's* silage ropes. The vetches were cut and stacked the same day. The stack is not yet opened, but it has the appearance of being a success.

5. I have had some experience of silage, though not very much. The opinion I am able to form is certainly in favour of it. I keep a large herd of dairy cows for butter-making, and I hardly think that I should like to be without some hay at any rate. It would not do to make it all into silage.

Mr. G. Whitcombe:—

3. I make some silage of one small rick of spoilt hay, which is probably worth nothing, and a rick of aftermath cut in September, which I hope will be good. It was stacked immediately after cutting, and pressed by Johnson's Ratchet Drum Press. Temperature ranged from 120° to 150°.

4. I have not made silage of any crop besides meadow grass.

5. I should think ensilage is a good resource in wet seasons.

HANTS.

Mr. John Barton:—

2. To some extent, though I do not advocate ensilage for breeding ewes or sheep generally.

3. Have never attempted to make ensilage; should think the right system is to cut grass dry and cart it to the silo, or make a heap of it and weight it.

5. From what I have seen it would be better to endeavour to make some portion into ensilage, than to allow all the grass to remain on the land to the detriment of the second crop.

Rev. J. G. S. Nichol:—

2. Of course silage can be made in a wet season, but it is not popular hereabouts. The expense of silos is a deterrent consideration. Again, when silage is made it does not take the place of hay. Many farmers send hay to the London market; if they made their grass into silage, it would not I fear now become a marketable commodity.

3 and 4. Made no silage.

5. This question is answered under No. 2. For home use I consider silage valuable, but not as a substitute for hay.

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* *Query* "Johnson's."—R. H. R.

Mr. T. Stirton :—

3. We made two stacks of ensilage during July, containing about 100 tons each. The grass was cut and carted the same day. One stack was weighted with sand and bricks, and Reynolds' Mechanical Pressure was used for the other. The temperature in each case never exceeded 130°. The result of the dead pressure has been a decided success, the silage being equal to that made in the silo. The other has not yet been tested. I may mention that we laid a quantity of the damaged hay upon the top of the stack, which prevented any waste with the exception of about eight inches round the sides.

4. Yes; trifolium and rye grass was put in two silos, the temperature in this case never exceeded 120°, although the pressure was not applied until some days after. The silos were filled in fine weather during the early part of June.

5. I certainly consider in a season such as we have just had that making ensilage is the only resource, and it must be preferable to hay that is mouldy and worthless as well as being unsaleable. In this locality alone hundreds of tons are rendered absolutely useless through being exposed so long to the wet weather, whereas with very little expense the grass might have been stacked at once, wet or dry, and made into ensilage, and thus have saved a heavy loss to the farmer in the way of fodder; for I find that whilst cattle will not touch the mouldy hay of this year they turn greedily to ensilage. I also find ensilage forms an excellent food for dairy stock in conjunction with other kinds of food.

HEREFORD.

Mr. T. Charles :—

2. In a season like 1888 I should certainly make most of my grass into ensilage.

3. Yes, about two-thirds. We commenced cutting grass and filling silo on June 25th, put in some grass most days till July 7th. At this date the silo was finally filled up, then covered with 3 in. deal planks, and weighted with petroleum casks filled with earth, the pressure would be about 70 lbs. to the square foot, the highest temperature was 110° F. The grass was mostly carried as soon as cut, there was a rainfall of 1·74 in. during the time the silo was being filled. I expect the result will be good, in fact I have no doubt about it. This is the fourth time of filling the same silo, having first filled it in 1884, but missed 1887, when the grass was too dry for ensilage. July 9th, commenced making ensilage stack, some of this grass had been cut four days, as at the time of cutting it was intended for hay, but the rain continuing it could not be made, the stack was finished on July 19th, then covered with 9 in. of earth, later on this was covered with a roof of hay and then thatched. The highest temperature in middle of stack was 131°, but about 18 in. from the outsides it was 160°. There was a rainfall of 2·72 in. during the time the stack was being made. This would be about 274 tons of rain to an acre. I do not expect this to come out so well as the other, as it was not carried so quickly after cutting as it should have been.

4. No.

5. In most seasons, especially in a season like 1888, when *good hay* could not be made.

KENT.

Mr. Kirkpatrick.—

3 and 4. I have never made silage; but this year I did prepare a chalk room for a stack, just before the change of weather.

5. I would try it, if we had the wet time of 1860 again.

Mr. W. L. Wigan :—

3. No. I had already as much as I could use. I sell most of my meadow hay.

4. Yes. Of rye, trifolium, rye and tares, and maize: rye and tares were thrown into a silo, 7 feet deep (with a temporary super-silo, that no room might be wasted). They were trodden round the edges and allowed to heat for some days, and then weighted with earth, in contact with the silage. It had no protection from rain. I have just opened this silo. The stuff is very good, between sweet and sour, and is being eaten by horses and lambs. Rye and trifolium were treated in the same way but in permanent silos with roofs. Maize was caught by frost and blackened before it was cut. I built a stack of it, and covered it with sand. I think it will be good sour silage.

5. Invaluable for a man who grows heavy crops of coarse grass, and *feeds it all.* But such a man ought never to make hay, always silage. At any rate he must make up his mind in time, and not spoil his silage by trying to make it into hay. For a man who grows a light crop of valuable hay for sale it is of no use.

————.*

3. I made three-quarters of my grass into silage lumps, simply putting it into lumps thus —the produce of 20 or 30 acres in one lump, then covering with earth—about 1 to 2 feet thick on sides, 2 to 4 feet on top. No control of temperature. Not opened any yet. Have one in use made 1886, October and November.

4. Put all my clover in silage, no other crop.

5. In very wet seasons silage well made is cheaper and better than hay badly made.

MONMOUTH.

Mr. R. Stratton :—

3. I made 70 acres of my heaviest grass and clover into "stack" silage. The stuff was hauled as soon after cutting as was practicable, generally the second day, into big heaps, the carts being hauled over it dung heap fashion. I put from 600 to 800 cartloads into a heap as nearly square as possible; a trace horse was kept to pull up the incline, and to tread down the outsides. When we could get no higher the rick was topped up with some 10 tons of damaged hay, and no other pressure applied. I took no account of temperature, but sometimes left the stack a couple of days to sweat and sink, and then went on hauling again. I have not opened mine yet, but have no doubt of the result being satisfactory: there will be a loss of about 6 to 8 inches round the outsides, but a mere nothing on the top or elsewhere. My brother, J. Stratton, Chilcomb, Winchester, has adopted the same system with excellent results, as has also another brother, W. Stratton, Kingston Deverill, Warminster.†

4. Clover and Timothy, as above stated.

5. I have no doubt of the very great advantage of making silage in a wet season; had I not adopted the system my losses would have been much greater. It is a serious question to my mind whether silage making is not more economical than root growing, for cattle feeding, either in a wet or dry season. I intend growing winter oats and vetches, cut them *early* for silage, and bring the land into roots after to be fed off with sheep.

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* Reply sent without any name.

† See p. 177.

OXON.

Mr. St. John L. Clowes :—

5. In anything of a summer, I much prefer the ordinary method of hay-making to ensilage, as I think there is not so much waste, and ensilage always requires a certain amount of chaffed hay or straw, to use with it, and we must have some hay for the sheep in winter. I saw a good many trials of making ensilage round here, and it seems to me some farmers have an idea you can make ensilage without the slightest care as to pressure or heat; but from what I can understand, it requires quite as much care and nearly as much labour as ordinary haymaking. Nevertheless, I shall take care to be prepared to give it trial in case of another wet summer.

SOMERSET.

Mr. E. Cary :—

3. Yes, I make about 100 tons of silage. I cannot give exact date of cutting, but this year being so exceptionally wet and the season late, I did not begin cutting till early part of September (or end of August, I am not quite certain which). I only allow the grass to remain a day before pitting. I do not make stacks, I press by putting 2-inch boards on the grass and weighting with stones; this I have found to answer very well for some years. I have tried covering down the grass directly a silo is filled, but for two years I have filled gradually, allowing it to heat to about 60° or 70°, and then go on putting in another supply till the silo is full. I expect my silage to turn out very well this year, as it has in past years.

4. From a few oats this year, but cannot say how this came out.

5. I thoroughly believe in ensilage made either in wet or dry seasons, provided care be taken in making. Some men in this neighbourhood have an idea that when their grass has been lying about for two or three weeks and almost spoilt, they can then put it up in stacks, cover it with a few loads of earth, and after allowing it to remain a few months with the rain running through it, to find good sweet silage. I know a number of cases of this kind at the present time.

Mr. J. Kidner :—

3 and 4. No.

5. I have had no experience, but wish I had tried the experiment this year, as the risk would have been small.

Mr. E. H. Llewellyn :—

2. Ensilage is another matter, and our farmers are not as yet convinced of the wisdom of adopting this method—chiefly I fancy on account of the risk to calving and calf-rearing in January and February months.

3. I have not yet tried ensilage; I share with my friends the doubt spoken i[illegible] reply to No. 2.

[illegible]aptain Sherston :—

[illegible] I made about 14 acres of grass into stack ensilage with Johnson's [illegible]ure, *i.e.* drums and wire ropes. Began July 4, and cut daily and [illegible]rried for about six days. Then stopped. Began cutting and carrying to [illegible]ne stack July 28, and again August 6. We finished the stack, I see, [illegible]gust 31. Each of the days on an average there were at work two carts, [illegible]d six men and boys. We kept the temperature as near to 120° as we [illegible]ould, using a tube and thermometer. The result will be that the ensilage

made when wet will be inferior, and great waste, some 18 inches or 2 feet, round the outside. That made when fairly dry appeared by samples cut out to be very sweet and good, and less waste outside. I mowed some rough grass later, and put it in a silo pit, and we are now cutting some more grass to ensile. A sample cut from the first lot is very sour, though we allowed it to heat thoroughly, which I account for by the grass being stalky and rough stuff.

5. Ensilage is useful in wet seasons, but to all appearance now before the stack is cut, there is so much waste outside as to make its use of doubtful advantage. I should advocate silo pits made so that beasts may be kept in them as boxes when the season is good for haymaking. I should never make ensilage if I could make hay.

Mr. G. Wright :—

3. I have not made silage myself, but have seen some made in this district. The mode, to keep cutting irrespective of weather, carting to a long rick, horses and carts pulling over it so as to press it, a man to keep levelling and keeping as even as possible; when finished carting, the sloping ends were cut off and thrown in the middle, it was at once covered with rough planks, and 12 inches to 18 inches deep of soil put on; no notice was taken of temperature. One I have seen opened; about 6 inches of outside are waste, but the rest is very good, and cattle are eating it with great eagerness, and I hear the milking results are very good. As I have not used any myself, I cannot say if it is injurious, but should think it would not do cows in calf any good, especially being wholly fed on it, fancying the great quantity of acid likely to procure abortion. I am eagerly watching to see if my theory is right in that respect.

4. No.

5. I have not the least doubt that ensilage is better than bad hay, and in such seasons as this the bulk has been made of very moderate quality, but shall still say hay, if made fairly well, is more useful than ensilage. The labour in making the latter is much greater, and the great weight taking horse labour to cart from ricks when serving, but I have not yet been able to get at real practical figures to compare prices.

SURREY.

Mr. W. Goodchild :—

3. We made silage of a considerable quantity of grass, some in good condition, and some half-made hay. The latter all went into a stack together with other products, and was rolled with Pearson's roller. This was a trial on a kind of save-all stack, but I know it heated too much, and my own experience in this, and what I have seen of neighbours' stacks built by the same means, would lead me to give this system a wide berth. The men simply hate the roller, and so do I. Much of the green and fairly succulent grass was stacked or put in silos, either mixed with or on the top of other crops as trifolium and tares. It is cutting out in good condition, and makes very serviceable silage. Our main stacks are pressed by Johnson's system, and on cutting turn out well, not having heated at the top, as was the case last year. For rapid building and putting together green stuff with facility no system is equal to this. A stack of 110 waggon-loads = 170 or 180 tons of green stuff was put up in a week, being 23 feet high just before wiring down the last time, and another of 120 tons was run up in four days. The first was made of alternate loads of tares and grass, and the last of all tares. Both cut out in good condition.

4. Trifolium was put into silos and weighted with bricks. After an

interval these were removed and grass put in. This too is all in good condition.

5. Ensilage in a wet season enables us at least to have a supply of sound and nutritious food, when probably the hay, both clover and grass, is washed out, dry, and nearly uneatable. Our only drawback is, the difficulty of cutting and carting crops for ensilage off arable land in wet weather. This is to us a serious matter, the ground being sticky and wet.

SUSSEX.

Mr. T. A. Abbott:—

3 and 4. We made a very large quantity of grass into silage. Some of it was in the condition of half-made hay. This was done at first in the way of experiment, to find if useful silage could be made from grass so much damaged. No notice was taken of the weather; on many days we carried grass to the silo with the water running from the bottom of the carts. Much of the grass had been in cock long enough to get dark and even mouldy, and in some cases the tops of the cocks looked green from the germination of the seeds. I may say we have a hundred and fifty feeding bullocks eating it with relish and doing well, as also are horses and sheep. Our silos are completely air-tight. No pressure is used other than treading by boys. We have twelve silos capable of holding 120 tons each. Having grown a large breadth of rye, trifolium and tares for silage purposes, many of our silos are filled with these crops, so that we had not nearly enough room for our grass silage, consequently we were obliged to build stacks. For these we used no compressing tackle, but simply placed the grass upon the ground, carting over the heap and spreading it evenly (in the same way as dungheaps are frequently made), and kept the sides well trodden by a horse led by a boy. In the air-tight silos I think the temperature never reached higher than 90°. If required, the temperature can be easily regulated by admitting or excluding the air from the air-tight doors. We are now using at one of our farms this half-made hay silage, and find it is pleasantly aromatic, and it is greatly relished by horned stock, horses and sheep. The silage from a large stack, made as above described, we have just commenced. There are probably 500 tons in it. It is simply covered with sand, a ton to a square yard of surface. There appears very little waste, and it has no unpleasant odour, and is rather sour. We are feeding the stock with it long or not chaffed, and though the bullocks are fatting, they eat it readily. As before mentioned, all our silos are air-tight, or rather on the air-exclusion principle, which was first advocated by Mr. James Howard, of Bedford, and which we believe is the safest and best, for the following reasons:—

1st. That it is absolutely certain that the silage can be relied upon to be good.

2nd. That so long as the silo is kept air-tight the silage will keep any length of time.

3rd. That the condition of the silage is the same from top to bottom.

Lastly. That there is not half a ton of waste or spoiled silage in a hundred tons; nor is there any appreciable waste from evaporation: the weight is nearly the same as was placed there.

5. My opinion of the value of silage this wet season is, that thousands of tons of wasted grass might have been saved and made into good wholesome fodder, the feeding value of which is equal, and I believe more than equal to roots. These silos are not as expensive as many think. An air-tight silo capable of holding 120 tons can be built for about 70*l.*, so that the annual rent would amount to about sevenpence per ton.

Aylesbury Dairy Company:—

3. As stated in answer to paragraph 1, about 70 acres were made into stack silage on the "Johnson" system with splendid results.

4. We always sow about 40 acres of trifolium and rye-grass on the wheat stubble, for the express purpose of making into silage; we had a heavy crop this year, and made a stack of about 250 tons.

5. Of enormous value.

Mr. W. Jordan:—

3. About 60 acres of meadow-grass and 20 of clover-seeds were made into ensilage during July and August; the grass was carried as soon as cut, and made into 50-ton silo stacks. The mode of pressure adopted was F. W. Reynolds and Co.'s patent system; probable results I have reason to believe will be satisfactory.

4. Clover-seeds, which I consider to be more valuable for ensilage than meadow-grass.

5. The value of ensilage in such a season as the past I think can scarcely be over-estimated, as by the silo system the grass as soon as come to maturity can be cut and at once stacked, thereby all the most valuable and nutritious properties of the grasses are saved that otherwise must be lost.

Mr. C. Liddelly:—

3. 10½ acres of rye-grass and clover, 2 acres of trifolium, cut and loaded in June. 2½ acres of oats, 3 acres of second cut clover, 1 acre of orchard and other grass for top and bottom, cut and loaded in August. Loaded into two silos, every two or three days alternately. Temperature kept at about 150° to 160°. The silos are in one end of a barn 20 feet long by 10 feet 6 inches wide by 18 feet deep. Pressure effected by Reynolds' screw apparatus, not put on, however, as long as it was possible to load with 4 feet of fresh fodder at a time, which supplied the necessary weight for compression, and for keeping the heat under 160°. The screws after they were put on were relieved for fresh loading twice in one and three times in the other silo in August.

4. No silage was made with anything except as stated above (No. 3).

5. I have used silage of the same kind as above described for four years, always made of good material, and I consider it useful and economical as winter feed. Much marshland grass, which was utterly destroyed for food in this neighbourhood by floods, might have been saved if silos had been provided.

WORCESTER.

Mr. W. Woodley:—

3. About 5 acres of rough grass as an experiment, which was cut, carried and stacked immediately after the machine, early in September. Each waggon-load well trodden on the stack, and when the stack was completed a layer of boards was put on, and on the top of the boards about 2 tons of stones were put for pressure. At the end of three weeks I cut one foot off each side, then removed stones and boards, and top up with that cut off, and thatch as usual. I found the outsides, where exposed to the air, very hot, but farther in the stack, where more compressed, it was in much better condition. I have not yet tested the stack.

Wilts.

Mr. E. Burbidge:—

3. Made three stacks of silage, and one in end of barn, and from experience of same found that which was cut and *carted* directly much the best, not requiring the pressure when stacked green and wet. Two other stacks were carted when grass was about half dry, and pressed by leverage on wire about 2 feet apart over the stack. Found it very difficult to keep temperature down. I am afraid the result of half-dried grass not satisfactory.

4. Nothing but grass and clover.

5. Think it might be used to very great advantage in wet seasons, and you cannot put too much in one stack, thereby serving waste from the outsides.

Messrs. C. and T. Coles:—

3. Yes. About 20 acres meadow-grass in two stacks, squared by hay knife into 10 yards by 5 yards each. Cut early in July, carted and stacked immediately; carted with ordinary manure carts, emptied, spread and stacked precisely as a manure-heap is made, only extra pressure used (besides the horses going over the stack with every load), being one or two led horses treading outside of stack whilst being built. When the stack was so high that the loads could not be well got on it without extra horses (about 8 feet high), one end was cut off, far enough in to leave the end same height as the centre of stack, also the sides, and carted up the remaining end, then the remaining end was cut off and thrown up and trodden by led horses; the whole of this work for one stack was completed in two days, and the manual labour cost about the same as for carting the same acreage in hay, the horse labour was about twice as much; but the work was done in wet weather when hay could not have been made. When the stack was finished it had sunk to 7 feet high. It was then covered with several loads of hurdles and wood put on it; after about three weeks this was thrown off (the stack having sunk to 6 feet 6 inches), and 10 acres of meadow hay put on it by elevator, roofed, and thatched. Results not known, but in second stack, made precisely the same way, a little of one end was left a fortnight, then cut. About 6 inches from all outsides it was spoiled, in further it was a greenish yellow, very sticky and smelt like very sweet heated hay; horses that had been having grass eat it freely; beyond this no stack has been tried yet.

4. No.

5. If it can be made satisfactorily in stacks, a proportion of about one-third of the hay crop would be a great gain as compared *with bad hay*, as it might be chaffed with straw and fed to great advantage, more particularly in *bad root seasons*, on the large arable farms in this district, where so much straw is grown.

Professor Malden:—

3. Yes; about 100 tons. In July. Close behind the scythe. Pitted, lead weight 75 lbs. per square foot; not caring particularly whether sweet or sour silage was made, no particular means were taken about regulating the temperature, beyond the ordinary one of thoroughly treading, and refilling after about three days. The probable results are that there will be good sound silage, varying somewhat from highly fermented sour, 90°–120°, to low fermented sweet, 120°–145°. There is no doubt but that it will be the best-preserved portion of this year's grass crop.

4. None.

5. Doubtless of great value. But it has this against it, that it is to all

intents unsalable in the public market, and can never become so popular for this purpose as hay because of its weight, which makes it expensive to move. Wet hay-times usually mean good root years, therefore a double crop of succulent food is not so valuable as a hay crop and a root crop. But it can safely be held over for a year if desired, when under other circumstances it would prove of greater value, especially when the other cropping of the farm had a chance of being arranged so as to meet the state of affairs. A farmer's hand is undoubtedly strengthened by having such a card to fall back upon as silage, for in a wet season he has a means of saving almost as much feeding material as he can in a fine one. I would personally prefer a good hay crop to a good silage crop, but would prefer moderately good silage to bad hay. But circumstances would doubtless decide others in their opinion on the subject. I think some silage has been made rather too casually this year, and expect to hear of several who will blame the produce rather than themselves.

Mr. Frank R. Moore :—

3. No.

5. Do not like it, and from what I have seen should not like to feed good stock on it.

Mr. William Stratton :—

3. I have made about one-third of my grass into silage on a system of my own, which is based on my observation as to the result of the old system of carting dung into big heaps on the straw yards, that result being that when the heap is thoroughly compressed by being carted on in a wet state no decomposition takes place, except on the outsides where the compression is imperfect. When I find the prospect of making grass into hay is unpromising, I set to work and cart it into a heap with the ordinary dung-carts fitted with a "head ladder" to enable a full load to be put up. Each load of grass is drawn by two or more horses on to the top of the heap and there tipped up, one man with a prong being kept on the heap to pull a portion out to the outsides. As the heap increases in height it becomes necessary to increase its length so as to form such an inclined plane as will enable the loads to be drawn upon the heap. I often leave the heap for a week or more, and then cut more grass and cart upon it. When all is got together, I set a lot of hands to work to cut off the ends of the heap, that is the inclined plane, which at either end are of course very thin. These ends are then thrown upon to the heap, being well trodden with horses as thrown up. Some *fresh* cut and *wet* grass is mixed with the part thrown up, and when finished the elevator is set to the heap, and a hay-rick is made on the top of the silage. No artificial pressure is needed, and the silage requires no further thought. I am of opinion that grass cannot be got together too wet, or too soon after being cut. But in the event of its being too dry damage may result from excessive heating. I may add that when the stack is completed within a few days of its having been begun, I pare the sides as well as cut off the ends. The larger the heap the less the surface exposed to the air, and consequently the less the proportion of waste, which I maintain is less under this system than any other. The cost is also in every way less. I think I should add that I have put together three stacks of silage this summer, containing each about grass enough to have made 40 tons of hay; the stacks when finished off measured about 20 yards in length by 7 yards wide and about 3 feet in depth when completed.

5. I consider silage a most valuable means of saving grass in wet weather.

WALES.

Captain Best, R.N.:—

3. I consider that the ordinary method (of haymaking) might be well assisted by ensilage, but the *cost of silo is too great for our small farms*, and unless put into silo I am sure *the waste in small ricks* is too large in proportion to crop for silo stacks to suit small farms.

Mr. Herbert Lloyd:—

3. This year, in consequence of the weather, I converted 15 acres into ensilage, about double what I had done before, or intended to do this season. Had I had the room I would have ensiled still more. I used Blunt's Lever Press on two stacks, and stones and iron on the third. This last one was built in a barn, three sides being against the walls. I cut the grass with a mowing machine in the morning, and carried it the same day. I began about July 1st, and carried at intervals for six weeks. I did not finish my hay until the second week in September. The system of haymaking on these hills is good. They cut only a small quantity at a time, which enables them to work it and put it safe in cocks whenever they see the chance of half a fine day. The rule is in fact—"Don't cut more in a wet season than you can manage by constant turning to dry and make safe in six hours." This applies of course to our small farms. I have often seen in England far more hay down than a farmer could possibly save in "catchy" weather. I have made ensilage for some years, but I do not test the temperature. I always ensure a sufficient weight on my stack to prevent excessive fermentation. In ordinary or wet seasons this is not difficult, but in such dry seasons as last year it is necessary to add weight or pressure, as it is impossible to carry your grass in that succulent condition that it should be. The poorest ensilage I have made was last year. Do what I would it was impossible even with a horse-rake following the mower to prevent the grass drying too fast. In fact it was dry before it was cut. I have put a small quantity of vetches into my stack, but I cannot give you the result at present. I began one stack (every bit of which was carried wet) this week. It is rather more sour than any I have made before. It was weighted with stones, and I fancy I put more weight on than I should have done to insure sweet ensilage, otherwise it seems all right. Cattle don't take to it as well as the sweet. I consider ensilage of the greatest value to hill farmers. The only drawback to it is that at present we have no handy press that would suit men with few hands. The one I have, good as it is, requires more power to take on and off than these small farmers can muster.

Mr. Jonas N. Trayler:—

3 and 4. August 11th: cut second crop clover and rye-grass (a heavy crop), and continued cutting portion each day of this and also crop of vetches with wheat, and trimmings of coarse grass round hedges. Began same day putting it into ensilage stack, and, with the exception of Sunday, carted about 20 loads each day until August 16th (on two of the days it rained). Adopted a suggestion I saw in 'The Field' of fixing six upright poles round sides of stack, and 11-inch boards on their edges inside of these poles, which enabled men to tread the material tightly to the edges. These boards were raised a course higher after each couple of loads or so. This plan I found very useful, and strongly recommend. August 17: covered the top with trimmings and rough stuff, and applied the pressure system of the Leicester Ensilage Press Co. The stack sank very rapidly and developed heat 160° to 180°—beyond what

I wished—but soon began to cool, and by end of next week was about 140°, at which temperature it remained for some time. To-day, November 19th, I have opened the stack, and find it injured to extent of about 6 inches at top and sides. The remainder is sweet silage of excellent quality, and my cows, which were quite unaccustomed to it, have eaten it freely and with apparent relish.

5. This is my first trial, but I think it will prove invaluable for wet seasons.

Any reader who has carefully gone through the above communications will have found the whole question of practical ensilage covered. The experiences recorded are as varied as they are valuable. From the silos of Mr. Whitehead, Mr. Harris, and Mr. Howman, to the economically constructed stacks of Mr. Stratton and Messrs. Coles, there is a wide range of almost all the prominent methods of making silage. Of the correspondents whose communications have been printed, thirty-two have had practical experience, and eight have not attempted it. All of the former speak favourably of its merits—some more enthusiastically than others. The most guarded commendation is that of Sir John Lawes, who has found, from careful experiment, a greater loss by 11·8 per cent. in making silage than in making first-rate hay. Perhaps it may be added that, to make the argument complete, the loss in making second-rate hay (or even bad hay) should also be considered. There is an almost universal opinion, in which even those who have not tried the system concur, that in wet seasons ensilage is an unquestionably valuable resource. Of the eight correspondents who have not tried ensilage, four are distinctly in favour of it, three "have their doubts," and only one is decidedly adverse. It should be added that the communications of few correspondents who answer the ensilage question with a simple negative have been omitted in this section.

It should be said that these communications were mostly written early in November, and that therefore the result of the silage-making was generally unknown. In some cases former experience has enabled the silage-maker to speak with practical confidence of the result. In some instances confidence is placed in methods whose chief recommendations are their simplicity and costlessness. It is to be hoped that this confidence will not be misplaced, but it is worthy of note that those who have made silage in former years usually prefer a method of making which is painstaking and careful. No doubt silage has been, and may be, made without pressure; but in the first place it is uncertain, and in the second place it will not, as a rule, keep. If a stack be properly made and pressure duly applied and kept on it, the silage will not only be good, but it will keep sound for months if necessary. Silage made with little or no pressure will

deteriorate rapidly after a time. It would be extremely satisfactory if it could be said that silage may be well made without the cost and labour of pressure, but so far as present experience of the subject goes, it must be still maintained that making silage—like every other farming operation—can only be well done by the expenditure of time, trouble, and money. It is a good old motto that "what is worth doing at all is worth doing well," and those are, generally speaking, the most successful who act up to it.

As for the mode of pressure, various hints may be gathered from the foregoing reports. Without attempting to dogmatise, it may be said that dead weight is the best form of pressure, where it can be conveniently and cheaply applied. Mr. William Stratton and Messrs. C. and T. Coles find it possible to build a hayrick on the top of the silage stack, and no doubt the result is satisfactory. But such an erection strikes one as a little precarious, inasmuch as silage has sometimes an awkward knack of sinking unevenly. However, in the face of the practical accomplishment of the feat criticism should be silent. The only practical objection to dead weights—besides the labour of putting them on and the difficulty, sometimes, of keeping them on—is that the temperature of the stack is not quite so readily under control as it is with a mechanical method; and the successful making of silage depends very much upon control of the temperature.

CORN AND OTHER CROPS.

Inasmuch as this article appears after the publication of the official Produce Returns, the remarks made by correspondents about the yield of crops are, to some extent, belated. Nevertheless, it will be of interest to record some of the opinions received, especially as throwing light upon the important point of "condition," although limits of space, in addition to the considerations above mentioned, necessitate considerable compression and omission.

Sir J. B. Lawes:—

6. The bad effect of the rain during the summer months was greatly modified by the extreme dryness of the soil previous to the commencement of the wet season. The proof of the dryness of the soil is to be found in the comparatively small amount of straw in the corn crops.

BERKS.

Mr. J. Bowles:—

6. Undoubtedly the greater part of the corn crops were influenced for the worse, the bloom in some instances affected, and some of the corn not

maturing; other, again, lost size and weight after cutting. I estimate the loss inflicted on my wheat crop as at least 4 bushels to the acre. Barley was a bad colour, but, with me, not a bad crop. Beans and peas I found a good crop, but very late off the ground, which caused inconvenience.

Mr. T. Latham :—

6. I consider the best-farmed land has not suffered so much from climatic influences as worse-farmed land has, and no doubt this valley is a very favoured district. The wheat will be under an average, but not seriously; the barley much under an average in quality, but fair in quantity; oats generally a poor crop; beans above an average; peas very variable; roots the best crop I ever grew.

Mr. H. Simmons :—

6. The wet summer proved without doubt, if proof were needed, that you cannot grow an abundant crop of corn, of good quality, without sunshine. As thrashing goes on the yield and quality is disappointing, and the straw is very inferior, from going down so early, and constant rains. Many farmers, who depend chiefly on corn, say it is the worst year they have had, and worse, or at any rate no better, than 1879.

Mr. R. Todd :—

6. The corn crops were retarded in their growth by the wet, cold weather, and harvest was consequently a month later with us than usual. The heavy rains beat down the wheat on well-farmed lands, and the grain ripened unevenly. Harvest work was very expensive, more so than ever I knew it; as much as 30*s*. per acre was paid for cutting, tying, and setting up wheat, in one instance, on our estate in Essex, and I heard of no lower prices being paid than 15*s*., whilst 20*s*., 25*s*., 27*s*., had to be paid to get the work done in several fields there. In this neighbourhood from 12*s*. to 15*s*. was the average price for cutting, &c., though 20*s*. and 25*s*. were frequently paid. This costly work, with a short yield and moderate samples of corn, all brought about by the wet season, must result in serious loss to the arable land farmers, as the better prices now realised for wheat will not counterbalance the short yield and expensive harvesting. It was noticeable, and worth recording, how much more the corn was laid where artificial manures had been applied in the spring. Barley is a bulky crop, but the grain is not the right colour for our brewers, and they complain of its germinating very unevenly. Oats are not much grown here, but they are a fair crop, and generally well harvested. Beans and peas are also average crops, and fairly well harvested.

DEVON.

Mr. Vincent P. Calmady :—

6. Good samples of wheat in my district are few and far between. I do not grow very much myself, but out of about 10 acres I do not consider I have one bushel fit to grind. The straw is fairly good. There is very little barley grown in my district; what I had myself was a poor sample, and very much stained. There were some very good crops of oats about, especially lay oats. Those after green crops suffered terribly from a small maggot in the main stem, which killed the stalk, and then the plant made fresh shoots, and threw up small, short ears, which made the crop very light, although the sample has turned out better than one could have expected. All the green crops seem to have suffered from the excessive wet, and although the seed took well, and looked very promising for some time, the roots are,

as a rule, very small indeed. At the same time, my drumhead cabbages, of which I grow several acres, are very fine indeed.

Mr. R. H. Lipscomb :—

6. The effect of the last summer upon the *growth* of straw was good, but upon the *yield* of corn bad. I have not seen one really bright sample of barley, the whole crop having become more or less discoloured in the ear. I live in a favoured district, and farm my few fields well, but my crop, though bulky, yields barely 30 bushels in place of the full 40 bushels of a good year. And the produce of only one of my three plots (which was quite free of weed, and was not sown with grass seeds) is fit for the maltster. Wheat, on the whole, suffered quite as much as barley; oats, perhaps, not quite so much. Neither mangels, swedes, nor common turnips are in my opinion an average crop, having ceased to grow during the drought of the greater part of August and September which followed the incessant rain in July, when it registered 5·14 at East Budleigh, and 4·91 at Little Silver, near Torrington in North Devon; rain falling on 24 of the 31 days here, and on 26 of the 31 at Little Silver.

Mr. W. Stevens :—

6. Corn much laid and rusted, reducing the yield, I think, 1 quarter per acre at least. Too much wet for roots.

Dorset.

Mr. E. W. Williams :—

6. Rank, and bad yield.

Glo'ster.

Hon. Captain Byng :—

6. Besides making the harvest very late, as the grain could not ripen, the quality of most corn is not very good, but better than was expected. The yield was good, and straw plentiful. Barley, on the whole, a fair sample. Root crops, as a whole, good.

Mr. Hobbs :—

6. I have no hesitation in saying that the whole of the cereal crops on my farm, beans excepted, were much damaged by the quantity of rain and lack of sunshine. The result of the wheat crop has, however, exceeded my expectations. I attribute this to the very favourable weather in the month of May.

Mr. E. W. Trinder :—

6. The wet weather and the absence of sun has damaged the corn generally, especially as to its colour and condition. The few samples of wheat that I have seen thrashed yield better than was expected, and the weight is average. The oat crop looked very bad early, but the rain saved it, and, generally, what was feared would be a bad crop turned out well. The straw is very good, and will make excellent fodder.

Hants.

Rev. J. G. S. Nichol :—

6. Hereabouts the corn yield is below average, but is threshing out better than was expected. Corn is unusually fine, long, and abundant. All corn is

more or less weathered, and much of the vetch crop damaged. One crop of the latter I saw being harvested as late as October 24th.

Mr. T. Stirton :—

6. The yield of wheat is especially disappointing, being of very bad quality, and, in cases where it has been blighted, almost unsalable; but it varies considerably, as in some localities the blight has not affected it so much as in others; the straw, however, is a large crop. Barley is much discoloured, and very little of it can be used for malting purposes. Oats are an excellent crop. The harvest this year was exceptionally late, being in this district quite three weeks later than in average seasons.

KENT.

Mr. J. Kirkpatrick :—

6. The harvest of other crops, which we expected to be a complete failure, has turned fairly well as an average crop, but we must wait for a frost to bring the wheat into condition. We expect wheat 4 qrs. an acre; barley, 4½ qrs.; oats, 8 qrs.; beans, 4 qrs.; peas, 3 qrs. Potatoes by no means good. Mangold, 5 tons; last year, 6 tons. Turnips, 2 tons; last year, ½ ton.

Mr. H. Rigden :—

6. The corn crops are yielding even worse than we expected, both as to quality and quantity. Turnips, an average crop. Wurzel, two-thirds of a crop.

Mr. W. L. Wigan :—

6. *Wheat:* The little thrashed much under average in quantity and quality. *Barley:* Every grain tipped with brown. *Potatoes:* Most sorts badly blighted; Magnum Bonum not blighted, but very small. *Mangold:* Under average. *Carrots and Parsnips:* Very heavy crops.

MONMOUTH.

Mr. R. Stratton :—

6. The wet summer damaged all the corn crops, both as to yield and quality, to the extent of 20 per cent.; that is to say, compared with the prospect of June, the result is fully 20 per cent. worse than might fairly have been anticipated. Roots on heavy land have suffered considerably, and are generally in a foul state, but are a full average crop, and grass has been abundant all through the season.

OXON.

Mr. St. John L. Clowes :—

6. The effect of the wet, cold summer on the swede crop is very evident, the roots being small and tough, thick in the skin, and show the effect of want of sun to force the saccharine in them, and not nearly so good as they were in 1887, when we had a very fair crop, of excellent quality. The wheat crop has suffered much from mildew, and though a large bulk of straw, the grain is very thin, and the amount of tail corn will be very large. The barleys looked a large crop, but, I think, will yield badly, and be very much stained, and only a small proportion fit for malting purposes. The oats seem to have suffered least, and we shall have a very fair yield, though the straw is not so good as last year.

SOMERSET.

Mr. E. Cary :—

6. Corn was very much laid and damaged in this neighbourhood, and yield, except oats, will be very bad. A quantity of straw. Grass plentiful.

Mr. J. Kidner :—

6. About one-third of my barley, which promised to be my best, was beaten close to the ground, and when fit to cut it was covered by a second crop in full ear; only a few acres of standing corn out of my whole crop. Wheat very poor, rusty and laid. See Experiments in next 'Bath and West of England Journal.' Flax promised to be a very fine crop, but the continued wet in July was too much for it, and a lot of it rotted instead of ripening. Swedes exceptionally good, turnips fair. The whole, after a big crop of trifolium, fed principally on the land with sheep. Mangel good.

Mr. E. H. Llewellyn :—

6. I grow no wheat. I found in a field of oats with clover sown under that the grasses and clover made such growth that I could not thrash the straw, and had to stack the whole for chaffing. The "ketchy" weather would not allow of my spending time in separating the clover when in swarth. I noticed a farmer doing this in the case of a barley crop. Of course with barley he was obliged to do so, but it must have cost him a lot in labour. I found my straw weak, and not well coloured.

Sir R. H. Paget, Bart., M.P. :—

6. Samples of corn generally bad or indifferent. Barley twi-ripe. Root crops very good.

SURREY.

Mr. W. Goodchild :—

6. Our corn as a whole grew fairly well, but much was lodged, and therefore the yield has suffered. The barley is discoloured, and the oats in many places are thin. Our wheat was thin, but as we shall not thresh till spring, I can only say we look for 7 sacks at most, when in 1885 and 1887 we had 9 or 10.

SUSSEX.

Mr. T. A. Abbott :—

6. The effect of the wet season upon corn crops upon our somewhat highly farmed poor land has been very disastrous, especially where exciting manures, such as nitrate of soda, has been used. The wheat and oat crops got lodged so early that the straw became mildewed, and the corn thin and light. I do not think our wheat will weigh above 58 lbs. per bushel.

Mr. C. Liddelly :—

6. Grain crops short, probably one-fourth less in quantity, and not so fine in quality as last year; great growth of *weeds*. Turnips and mangolds good, better than usual in this district; great grass crops and abundance of autumn feed.

WORCESTER.

Mr. W. Woodley :—

6. Great quantity of straw per acre; the quantity of corn about the average, but the quality inferior, owing to its ripening at different times in the season. Root crops very good.

WILTS.

Mr. C. Burbidge :—

6. The wet season in this arable district has been ruinous to the corn crops, especially where a great amount of cake and corn has been fed (on account of the deficiency of the root crop); it has formed a crop of straw, but the corn, both wheat and barley, is a very bad yield per acre, and a poor sample, especially the wheat, in many fields the crop not making 60*s.* per acre even after the tillages for the preparation of the same would amount to 5*l.* per acre. Also the root crop is not so good as generally expected, it being too wet for clearing them.

Mr. E. Burbidge :—

6. Plenty of straw and little corn, and that out of condition.

Messrs. C. and T. Coles :—

6. An increased bulk of straw, a considerable portion being laid, therefore of very inferior quality, a decreased yield of corn (except oats), and both straw and corn (except oats) of very inferior quality. Grasses and clovers where left for seed, worse crops and quality of seed than corn; straw heavy, but inferior. Roots and green crops of every description generally very good. Early sowings of turnips were destroyed by fly, but later there was generally a splendid plant.

Professor Malden :—

6. The corn crops are neither good in quality or quantity, and they were harvested badly.

Mr. F. R. Moore :—

6. Wheat is the worst crop grown for many years; barley is of bad colour and low price, but nearly an average crop; oats fairly good.

ISLE OF WIGHT.

Mr. Cecil B. Dixon :—

6. *Wheat:* Plenty of straw. Corn of poor quality, much of the wheat quite like "tailings." On some farms there is a "fair" yield, quality and weight; the latter from 61 lb. to 63 lb. per bushel, quite 10 bushels per acre under an average crop. *Barley:* As a rule, bad colour. Much *thin* grain (in some instances 4 bushels thin in a total of 12 bushels). That carted early, in bad condition, but in the fortnight of fine weather much better saved. This crop varies much in quantity and quality, the best weighing up to 55 lb. per bushel. Yield 12 bushels per acre under average. *Oats:* An average yield, but weight and quality poor. *Peas:* In many instances a complete failure. Where there are any, yield not over 20 bushels per acre. Large quantity of hulm, much of which got rotted. *Roots:* Not good crops. Plenty of green; but owing to the difficulty of cleaning the ground from weeds, no weight of bulbs.

WALES.

Captain Best, R.N. :—

6. Our corn crop is a failure; straw light. Corn never filled, and most farms cut green. I have not finished harvest yet (November), and have chaffed a lot of it for horses (corn and all).

Mr. Jonas N. Trayler :—

6. Plenty of straw. Oats a fair yield. Barley and wheat a poor yield, and grain badly filled. Hardly any barley fit for malting in this neighbourhood.

Probably the first thought which will arise after reading these statements as to the corn crops will be one of surprise at the fact that the Agricultural Department is able, from the returns furnished by the official estimators, to make the yield of the past season so satisfactory. The official figures were probably collected just about the same time as these replies, yet the divergence in results, though it cannot be expressed statistically, is obvious. The fact, so far as any definite conclusion can be drawn from it, goes to prove the remarkable variations of yield in different districts—and even in different parts of the same district—which were a marked feature of the past season.

There is little which need be added to the concise notes given above. Mr. T. Latham refers to an important point in his remark, that "the best crops are on the best-farmed land." No doubt even in the worst seasons good farming tells its own tale. There is a general complaint as to the quality and condition of the barley crop. One or two correspondents observe that artificial manures had an injurious effect this season, the crops being more laid where they were used. There do not, however, appear to be sufficient data for any general deduction on this point.

LIVE STOCK.

The replies as to the health of live stock are mostly brief, and they have been, from considerations of space, somewhat curtailed. In some cases some general remarks are appended to the answers under this head.

Sir J. B. Lawes :—

7. Live stock did very well, and they were not worried by flies, as they generally are in hot dry weather. Taking it altogether, I should prefer the season of 1888 to that of 1887. Having a large dairy and a quantity of cattle, the large crop of grass, especially of after-grass, and roots, more than compensate for worse grain crops.

Mr. A. Howman :—

7. No special effect noticed. I don't consider the last has been an especially ... season, but cold and sunless.

Mr. J. Bateman :—

7. Loose bowels in horned stock. Unhealthy season for lambs.

BERKS.

Mr. T. J. Bowles :—

7. My stock were not apparently affected till, say, September, when I found it necessary in some instances to give some dry food, and in the case of beasts intended for growing up to begin giving cake. The grass appearing to have no heart in it, I was not feeding any low-lying ground.

Mr. T. Latham :—

7. Our sheep and cattle generally have done well, and been very healthy.

Mr. H. Simmons :—

7. Our stock have been healthy, and summered fairly well. I cannot say the wet weather had any damaging effect. Grazing has paid well on the whole.

Mr. R. Todd :—

7. I did not notice that the health of the live stock was at all affected by the wet season. Cattle thrived well in the pastures, helped with cotton-cake, and sheep, with a little care and management in occasionally moving them off the arable on to pastures, as is usual in wet weather, have done fairly well. From what I have said you will readily come to the conclusion that in this district the wet weather only seriously affected the hay and the corn harvest, and in the face of this, I am glad to say, there seems more life in farming, and farmers seem more cheerful and hopeful than they have done for several years.

DEVON.

Mr. Evan Baillie :—

7. The young stock did not seem to thrive as usual, the wet grass producing scour. Several cows and heifers, supposed to be in calf, "returned" after service, some three months after, and altogether it was not a satisfactory season for the dairy or for rearing stock; too much wet grass. The fine dry weather in September and October was a great benefit to all kinds of crops and cattle in Devonshire; in fact we should have done very badly indeed without it.

Mr. V. P. Calmady :—

7. The bullocks appear to have done *remarkably* well all through my district; indeed, I hardly ever recollect their doing better. Sheep also appear to be healthy and well, and for my own—Shropshire Downs—I could not wish for them to look better, and I do not see that the wet has, so far, shown any ill-effect upon the sheep in the district.

Mr. R. H. Lipscombe :—

7. I can say confidently that I never knew cattle do better than during 1888 grazing season. There was just enough rain to keep the grass always growing, but without making it too watery, and the subsoil was generally so dry that the whole of the 5 inches of rainfall which fell in July sunk into the ground without once filling or even reaching the ditches!

GLOUCESTER.

Mr. Hobbs :—

7. The stock have generally been in good health. I keep rock salt before sheep when on grass.

Mr. E. W. Trinder :—

7. The live stock suffered very much; all my cattle and sheep coughed terribly, and gave a great deal of trouble and anxiety, but the unusually fine autumn has carried them through it, and so to speak, the epidemic has passed away. The cattle were all drenched with Day, Son and Hewitt's medicine with success. The sheep on turnips were fed with chaff and corn, and the cough has quite disappeared, no medicine was given. Out of 500 sheep scarcely one escaped, but they have, however, done well on the whole.

HANTS.

Mr. J. Barton :—

7. Live stock not injured as to health; did not thrive on the saturated green food.

Rev. J. G. S. Nichol :—

7. Stock has done fairly well; better probably than during the hot summer of last year. There has been an abundance of feed, though, perhaps, the wet season has deprived it of some of its goodness. I think shelter sheds for grazing and dairy cattle most desirable, either as a protection from continual rain or excessive heat, where the beasts can chew the cud in comfort under cover at their pleasure. In a wet season like this year there is always danger of diarrhœa and dysentery being induced by the excessive moisture of the grass. I had a serious case myself. This may, I think, be averted by a judicious allowance of hay and cotton-cake.

Mr. T. Stirton :—

7. The health of stock has not, as a rule, been visibly affected, although cattle did not thrive quite so well as they did last year on very bare pasture. The wet summer had an injurious effect upon young stock that were not housed at nights, as they were more liable to contract "husk" or "hoose." The best preventive of this is, I find, to keep them up in yards all night, giving them at the same time a little dry food.

KENT.

Mr. J. Kirkpatrick :—

7. Cattle very loose from the wet at first, but have since thriven immensely. I have some now calving in the fields. Sheep suffered from the last hard winter; wool very light, and losses in lambing; but I have never seen the flock in better condition than it is now. Lambs not quite so good.

Mr. H. Rigden :—

[illegible]. We have found all sheep and cattle sound and healthy and have gene- [illegible] done well. Foot-rot has prevailed owing to the wet weather, but no [illegible] [illegible]ly on the very lowest and wettest lands.

M[illegible] Wigan :—

[illegible] should be prevented from getting too much watery grass, by being early folded—on grass if it is wished—and fed with dry food, being allowed a fresh piece of grass daily.

MONMOUTH.

Mr. R. Stratton :—

7. Cattle did fairly well through the season; if the grass was not quite of the usual quality, the weather was cool, and there was a general absence of "fly."

OXON.

Mr. St. John L. Clowes :—

7. I think I never saw grazing stock do so badly as this summer, as though the older beasts did not seem to feel it so much, the younger stock, with the continuous wet and cold nights, never seemed to lie dry, and the grass being of a washy nature, they throve badly. A good open shed in the fields, where they could get under in wet nights, would have been of great benefit to them. Sheep seem to have done fairly well, but I observe a large number of lame sheep, suffering from foot-rot, caused by the continuous wet.

SOMERSET.

Mr. J. S. Bult :—

7. My stock has been very healthy in general, but the continuous wet has caused the sheep to suffer much from foot-rot.

Mr. E. Cary :—

7. I think not, except in case where stock was badly fed last winter. In wet seasons I give a certain quantity of dry food, generally a mixture of good hay chaff, with a little meal (bean, barley, wheat and oats mixed), this keeps all stock in thriving condition.

Mr. John Kidner :—

7. Live stock healthy. I took the precaution to give my ewe lambs a little linseed-cake up to the middle of September, and the calves a little up to August; I consider they have well repaid it. The wether lambs get a little mixture all through the season.

Mr. E. H. Llewellyn :—

7. My dairy cows and young beasts did not do as well this year as last, notwithstanding the drought of 1887. Of course the yield of milk was greater this year, but my cows are not looking as well as last year. I should mention that my land is well watered. Had it been the reverse, the beasts would not have kept their condition so well. I give my animals, young ones especially, hay at times throughout the summer, not much, but I think it well worth doing. Feeding on wet grass for long is bound to pull them back. I have given up growing roots. In a good root year I can purchase the few tons I require at a reasonable price, and in a dry season I find the cost of labour makes it an unremunerative crop. I prefer to spend my money in cake or crushed oats for cows after calving.

Sir R. H. Paget, Bart., M.P. :—

7. No; calves have a good deal of "husk."

Captain J. D. Sherston :—

7. My cattle have been healthy; but I separated the weakly ones, giving them cake. Many attribute the lung disease prevalent, and called pleuro-

pneumonia, to the low condition the cattle were in, and wet season following the cold and backward spring; to this I agree. All harvest operations were very late, throwing everything backward, as wheat sowing and flax harvesting, and I have still 5 acres of wheat to sow, and 2 acres of flax to secure after setting, and I keep a full complement of horses and men, and get full work out of them.

Mr. G. Wright :—

7. The hard winter followed by the wet summer has been very injurious to stock, and from my knowledge of some of the herds where "pleuro" has broken out, they were not well fed during the deep snows, and consequently the wet season has accelerated lung disease. One inexpensive luxury for stock is taken very little note of, viz., a lump of rock salt to run at; I think it sharpens their appetite and often induces them to eat.

Surrey.

Mr. W. Goodchild :—

7. The health of our stock has been good throughout. All, even the poultry, were somewhat at a standstill during July, but the fine autumn has enabled them to develop even more than usual. We always give a little dry-food cake in wet times to the outdoor stock.

Sussex.

Mr. T. A. Abbott :—

7. The health of stock has been very seriously affected, particularly Channel Islands stock, and husk and pulmonary disorders are very prevalent. Generous supplies of dry food and protection from frosts seem to be the best preventives.

Mr. W. Jordan :—

7. Nearly all kinds of stock here were slightly affected with scour; feeding to cotton-cake had a most beneficial effect, and with the improved weather during the greater part of October a marked improvement was noticeable.

Worcester.

Mr. W. Woodley :—

7. Feeding cows suffered from the wet, frequently taking cold in the udder, which brought on white water; I found it very advantageous to give them shelter at night. Lambs suffered much from the wet, which brought on scour; many died in the neighbourhood; best remedy found about here was old oats and oil-cake, given soon after weaning.

Wilts.

Mr. C. Burbidge :—

[illegible] Stock (principally sheep) are considered on these down farms to be healthy and in fair condition.

[illegible] :—

[illegible] pretty healthy, but did not thrive with such abundance of grass [illegible] in the season, when they pulled up well. No rot with sheep, as we expected, owing to the dry weather in the autumn for a few weeks.

Messrs. C. and T. Coles :—

7. Yes; our sheep became very lame from foot-halt whilst eating vetches, which we attributed to their feet always being wet, through the vetches being very thick, and rain falling almost every day whilst they were being fed; the sheep certainly were better as soon as the weather became fine and they had drier lying. We have been very much troubled with husk in young calves, which we must also place to the credit of the wet cold season. We have had more sheep with foot-halt (and no calves with husk previously, though an equal number bred) than in the five preceding years. We consider that all stock generally have not thriven so well in proportion to green food given them as in drier seasons, and we particularly noted that sheep, of which we sold a weekly consignment by weight, did not pull down the weights according to the time they had been grazing, as in 1887.

Professor Malden :—

7. The wet had no visible bad effect on the animals, all of which have done remarkably well. If there is any fluke about it has not developed.

Mr. Frank R. Moore :—

7. Sheep did badly through the whole of the summer; their food did not do them the natural amount of good, and a lot of lameness was prevalent the whole of the summer. I consider sheep are in a more healthy condition now than any time during the present year.

Mr. W. Stratton :—

7. Weather was favourable for stock.

Isle of Wight.

Mr. Cecil B. Dixon :—

7. General health good, but could not be kept in good condition without artificial food. Butter yield about an average; but where no extra food given quality very poor. Much larger yield of *milk* in many cases, but less butter than usual. Many instances of cows dropping from "milk fever," owing no doubt to their getting too much grass.

Wales.

Captain Best, R.N. :—

7. Stock have done well, and sold well up to the end of October. We have had exactly the same amount of rainfall as last year, which was exceptionally dry.

Mr. Herbert Lloyd :—

7. I think that stock, in spite of the cold and wet, did well. In fact, one of my tenants told me the other day that his store stock did *far better* this summer than last. He said he *could not account for it.*

Mr. Jonas N. Trayler :—

7. Not to my knowledge, but should be apprehensive of fluke in sheep next season, owing to conditions this year favourable for development of the specific parasite on vegetation.

While it cannot be said that there is proof of any specific disease being the outcome of the past season, several replies indicate the weather as a predisposing cause to outbreaks of, for example, pleuro-pneumonia. Husk in lambs, foot-rot and fluke in sheep, and scour in stock generally may be included among the risks to be guarded specially against in a damp cold season, such as the summer of 1888. The caution contained in the last reply is worth notice. Mr. Trayler expresses his apprehension that fluke may develop next year, owing to the favourable conditions of the past season for the growth of the parasite. This is a matter which deserves the attention of flock-masters.

APPENDIX.

Names and addresses of the correspondents whose replies appear in the foregoing article: —

Abbott, T. A. (agent to Mr. R. Whitehead), Old Paddockhurst, Worth, Crawley.
Aylesbury Dairy Company (G. M. Allender, Managing Director), Horsham.
Baillie, Evan, Filleigh, Chudleigh, Devon.
Barton, J., Hackwood Farm, Basingstoke.
Bateman, J., Brightlingsea, Essex.
Best, Captain J. C., R.N., Vivod, Llangollen.
Bowles, T. J., Milton Hill, Steventon.
Bult, J. S., Dodhill House, Taunton.
Burbidge, C., Chitterne St. Mary, Codford, Wilts.
Burbidge, E., South Wraxall, Bradford-on-Avon.
Byng, Hon. Captain, Sherborne House, Northleach.
Cary, E., Pylle, Shepton Mallet.
Charles, T., Caerswall, Much Marcle, Herefordshire.
Clowes, St. John L., Dunthrop, Chipping Norton.
Coles, C. and T., Manor House, Winterbourne Stoke, Salisbury.
Dixon, C. B., Clatford, Bevois Hill, Southampton.
Goodchild, W., Stilehurst, Capel, Dorking.
Harris, W. J., Haliwell Manor, Highampton, Devon.
Hobbs, Charles (and James), Maiseyhampton, Fairford.
Howman, H. A., Kingsbury, Tamworth.
Jordan, W., Tilgate, Crawley.
Kidner, J., Nynehead, Wellington.
Kirkpatrick, J., Monk's Horton, Hythe, Kent.
Latham, T., Little Wittenham, Abingdon.
Lawes, Sir J. B., Bart., LL.D., F.R.S., Rothamsted, St. Albans.
Liddelly, C. (24, Abingdon Street, Westminster), Peasmarch, Sussex.
Lipscomb, R. H., East Budleigh, Budleigh Salterton, Devon.
Llewellyn, Evan H., Langford Court, Somerset.
Lloyd, H., Kilybrbyll, Pontardawe, Swansea.
Malden, Professor, College of Agriculture, Downton, Salisbury.
Moore, F. R., Littlecott, Upavon, Wilts.
Nichol, Rev. J. G. S., N. Litchfield Rectory, Whitchurch.
…et, Sir R. H., Bart, M.P., Cranmore, Shepton Mallet.
…gden, H., Broadstreet House, Lyminge Station, Hythe.
Sherston, Captain J. D., Evercreech, Bath.
Simmons, H., Bearwood Farm, Wokingham.

Stevens, W. (steward to the Right Hon. Sir T. D. Acland, Bart.), Budlake, Broadclyst.
Stirton, T., West Stratton, Micheldever.
Stratton, R., The Duffryn, Newport, Mon.
Stratton, W., Kingston Deverell, Warminster.
Todd, R. (agent to Mr. R. Benyon), Englefield, Reading.
Trayler, J. N., The Tannery, Pembroke.
Trinder, E. W., Perrott's Brook, Cirencester.
Whitcombe, G., Tuffley Knoll, Gloucester.
Williams, E. W., Herringston, Dorchester.
Wigan, W. L., Larkfield House, Maidstone.
Woodley, W. (bailiff to Mr. G. E. Martin), Ham Court, Upton-on-Severn.
Wright, G. (estate bailiff to Sir R. H. Paget, Bart., M.P.), Cranmore, Shepton Mallet.

XIII.—*Winter Fattening of Cattle. Does it Pay?*

By WILLIAM STEVENS, Budlake, Broad Clyst.

IF the above question were asked before an assembly of farmers, it is known from experience that the answers to it would convey doubt in the matter, *e.g.*, one would say, "I don't think it does;" another, "I hardly know whether it does or not;" another, "Sometimes it does, and sometimes it does not." I am of opinion that, taking a period of say seven years, it does not pay, but, on the contrary, is attended with loss.

Let me try to illustrate this. On Sir Thomas Acland's Home Farm at Killerton there were, on the 3rd of December, 1888, 224 bullocks of various ages; 30 of these were fat, and 30 more nearly fat.

On the 29th of October, 1888, 25 steers had been tied in their stalls, but before this was done they were (as is the usual custom on the above farm when housing cattle for winter feeding) put on the weigh-bridge. Their collective live weight was 307 cwts. 2 qrs. 7 lbs.

On the 1st of December (being a fine day) they were again weighed, and found to be 324 cwts. 3 qrs. 14 lbs., which gives a gain of 17 cwts. 1 qr. 7 lbs., or an average gain per head of 77·56 lbs. live weight in 33 days, equal to 2·35 lbs. per day, or 16·45 lbs. per week.

Now let us suppose, as the bullocks were fairly good beef when tied in on the 29th of October, that of the gain of 16·45 lbs. per head live weight, there were 15 lbs. of beef, and this at 12*s.* per score lbs., would be 9*s.* I have no doubt that many men will say that I am taking too great a portion of the increased weight for beef. I would, however, remark that after a bullock of say 3 years old and upwards is fairly fat, any increase of live weight is, I imagine, chiefly beef, as the bones, hide, and entrails are nearly if not fully developed.

Having settled what is considered the gain in beef, and value thereof per head per week, viz. 15 lbs., worth 9*s*., I will now show what it cost to produce this. Instructions were given to have the food consumed in a day by one of the bullocks weighed; the result was 60 lbs. of pulped roots (mangold and common turnips), 14 lbs. of hay chaff, 9 lbs. of cake, and 7 lbs. of barley-meal, besides 2 buckets of water, weighing 62 lbs. I was surprised at the large quantity of water drunk, considering such a liberal allowance of roots was eaten.

Let it be here observed that the said bullock was above the average in size, therefore, and for the sake of easier calculation, I will put the food at 56 lbs. roots, 14 lbs. hay chaff, 8 lbs. of cake, and 7 lbs. of barley-meal daily.

Now for the cost of the food per day:—

			s.	*d.*
56 lbs.	of roots at 10*s*. per ton *	=	0	3
14 „	hay chaff at 80*s*. per ton.. ..	=	0	6
8 „	linseed cake at 1*d*. per lb. ..	=	0	8
7 „	barley-meal, say	=	0	5
	Total		1	10

Equal to 1*s*. 10*d*. per day, or 12*s*. 10*d*. per week.

We have next to make allowance for the manurial value of the above food.

					s.	*d.*
3 cwts.	2 qrs.	0 lbs.	roots per week at 4*s*. per ton, say	=	0	9
3 „	14 „		hay „ „ „ 15*s*. „ „	=	0	8
2 „	0 „		cake „ „	=	1	7
1 „	21 „		barley-meal „ „ say	=	0	10
			Total		3	10

Equal to 3*s*. 10*d*. per week; this deducted from 12*s*. 10*d*., the cost of food, leaves 9*s*., being exactly the sum gained in beef.

From the above facts it will be seen that there is no margin for risks in sickness, or loss of cattle.

On the 11th of December these 25 steers were again weighed, and showed a further gain of 3 cwts. 0 qr. 7 lbs. only, or an average gain of 9·59 lbs. live weight per week, which, at the foregoing cost of food and price of beef, involves a comparative falling off to the amount of 3*s*. 9*d*. per head per week. These facts show how important it is to periodically weigh fattening cattle, to test their thriving condition, or the contrary. Several of these steers had not gained anything in live weight the last 10 days.

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* This price is intended to include the cost of hauling and pulping the roots, and serving the cattle.

On the 12th of December they were sold by auction at Exeter Fair, and it may be of interest if I give the separate weight and price of each beast.

	Live Weight.			Dead Weight, at 64 lbs. per cwt.		Value at 12*s.* per score lbs.			Price realised.			REMARKS.
Lot	cwts.	qrs.	lbs.	sc.	lbs.	£	*s.*	*d.*	£	*s.*	*d.*	
1	11	3	0	37	10	22	10	0	20	0	0	Sold cheap.
2	11	0	0	35	4	21	2	6	21	5	0	
3	11	0	0	35	4	21	2	6	20	7	6	
4	10	0	21	32	10	19	10	0	18	10	0	
5	17	0	0	54	10	32	14	0	31	5	0	
6	14	3	0	47	4	28	5	0	26	15	0	
7	15	3	0	50	10	30	5	0	32	0	0	A favourite; good quality and extra fat.
8	16	0	14	51	10	31	0	0	31	10	0	Dead weight was 50 sc. 15 lbs.
9	15	0	0	48	0	28	15	0	31	0	0	Dead weight was 48 sc. 12 lbs.
10	15	3	0	50	10	30	5	0	31	10	0	Dead weight was 50 sc. 12 lbs.
11	16	1	0	52	0	31	5	0	32	10	0	A very good beast.
12	13	0	0	41	10	25	0	0	24	10	0	
13	15	1	7	49	0	29	10	0	28	0	0	Rather coarse.
14	15	0	0	48	0	28	15	0	28	10	0	
15	13	0	0	41	10	25	0	0	22	5	0	Shorthorn Cross.
16	13	3	14	44	5	26	10	0	24	0	0	Rather coarse and not "well up."
17	11	1	0	36	0	21	10	0	19	5	0	Inferior beef.
18	12	1	0	39	4	23	10	0	21	0	0	Ditto.
19	11	1	7	36	4	21	15	0	22	0	0	Good quality.
20	11	1	0	36	0	21	10	0	21	15	0	Ditto.
21	11	1	0	36	0	21	10	0	19	10	0	
22	12	1	14	39	10	23	15	0	21	15	0	A wild bullock.
23	11	2	21	37	10	22	10	0	22	5	0	
24	10	3	14	34	15	20	17	0	20	10	0	
25	10	3	21	35	0	21	0	0	20	10	0	
Total ..	327	3	21	1049	0	629	6	0	612	7	6	

There is a difference of 16*l.* 18*s.* 6*d.* between the value at 12*s.* per score and the prices obtained, which means a little over 3*d.* per score, or 11*s.* 9*d.* instead of 12*s.* or 13*s.* 6*d.* per head.

If winter feeding (fattening) of cattle does not pay, the question naturally arises, how should winter food be consumed so as if possible to realise a profit?

In the first place, on healthy sheepland I would advise the consuming of roots where they grow, and thus avoid the expense of hauling the roots to, and the manure from the farmyard.

We have tested the live weight gain of sheep on roots, and found it to be over 2 lbs. per head per week.

On the 7th of January, 1888, five long-wool and five black-face hogs were weighed; the former five were 4 cwts. 3 qrs. 19 lbs., the latter, 4 cwt. 3 qrs. 4 lbs.

On the 27th of February they were again weighed, when the

former were 5 cwts. 2 qrs. 11 lbs., the latter 5 cwts. 2 qrs. 14 lbs., showing a gain on the long-wools of 2·08 lbs., and on the black faces of 2·58 lbs. per head per week.

They were eating cut mangold, and had about ½ lb. of linseed cake a day; this, after reckoning man's wages for cutting and serving, and for cake consumed, surely means a profit. We should also bear in mind that sheep are first-rate manure distributors.

The cost in food, &c., per sheep per week is estimated as follows:—

	d.
Roots (1 cwt.)	6
Cake	3½
*Attendance	2
	11½
Deduct manurial value of roots and cake	3½
	8*d.*

I will put the gain at 1½ lb. of mutton per week, at 7½*d.* per lb., equal to 11¼*d.*; this gives a profit of 3¼*d.* per head per week.

If, however, the land is heavy so that sheep cannot be folded on it, let the roots be given to young growing cattle, and with some hay and straw chaff, and a little cake, keep them moving on to early maturity, and get them out as beef, say, in the months of June and July, when beef is scarce and commands the highest price.

I suppose it will unavoidably happen on most farms that some cattle will always have to be winter fattened such as cows off the dairy, and other cattle three parts fat, what is called "finished out."

Lastly, and this cannot be too strongly brought home to the earnest attention of farmers, many of whom are very careless in the matter, it is of the utmost importance that sufficient and proper food should be given to young growing cattle, to enable them to put on flesh and thus pay for the food consumed.

With a certain quantity of food a bullock merely lives and gains nothing, and the value of the food consumed is lost, except the small manurial value.† With a sufficient quantity

* This includes cleaning and cutting roots and serving to sheep, shifting hurdles, &c., a man being reckoned as attending to 100 sheep.

† I may perhaps be excused for quoting, in support of what Mr. Stevens has urged, a short passage from a paper on the 'Chemistry of Practical Farming,' vol. iii. of this 'Journal,' 1855:—

Those who have not attended to chemistry will feel some surprise when I state that though the live stock do not carry much carbon to market on their frames, they have consumed—that is fairly burnt away—in their lungs [I should

of proper food the animal does well; whereas—and unfortunately it often happens—if too little food be given, the animal deteriorates, and this means not only a loss of the value of the food, but also a serious loss of "calf flesh," which it takes much time and expense to (if ever) replace.

One word on quality. How frequently do we find farmers sending their cows to a bull of inferior quality and no pedigree just to save, as they think, half-a crown, quite indifferent of the probability that an investment of another half-crown might mean a five-pound note when the offspring has to be sold at two and a half or three years old.

Mr. Lloyd, the Lecturer at King's College, furnishes a statement of the materials required in food daily to fatten a bullock, viz.:—

Oxen Fatting.	Live Weight.	Dry Matter.	Digestible.		
			Albumenoids.	Carbo-hydrates.	Fat.
	Lbs.	Lbs.	Lbs.	Lbs.	Lbs.
Third period	Per 1000	25·0	2·7	14·8	0·60

STATEMENT of MATERIALS contained in the FOOD consumed by the 25 STEERS referred to in this PAPER:—

Third period	Per 1000	20·13	2·66	12·03	0·69

have said in their blood or in their bodies] about half of all the carbon contained in the roots and grass which they have eaten, to keep up animal warmth. The mineral matters contained in their food pass through into their dung practically undiminished, with the exception of the phosphate laid up in their bones."

"If, therefore, the bullock has put on no flesh or fat, the whole food is dead loss, and the value of manure voided from ordinary food without cake, would be but small." The calculation here quoted was arrived at thus: "Boussingault ascertained by careful experiment that a cow consumed rather more than 70 oz. of carbon daily, which would amount in twenty weeks to 612 lbs. The amount of carbon in roots is about half the dry organic matter, and this again is about one-tenth of the whole weight of the roots; so that the weight of the roots required to supply the carbon consumed in the breath would be above 12,000 lbs., or nearly 5 tons. Two bullocks, eating about 1½ cwt. of roots each per day, would consume 20 tons (the produce assumed per acre) in twenty weeks, of which 10 tons would have passed off in the carbonic acid of the breath. The estimate for grass would not be any different."

I am not sure that calculations more than thirty years old will bear modern criticism. But if they are not far wrong, the moral is as good as ever: Breed stock of good *quality*, and keep them well while they are growing, so as not to spend food for nothing.—T. D. ACLAND.

XIV.—*Milk Record at Cranmore Hall (Home Farm).* By Sir R. H. Paget, Bart.

The following statement was recently sent by my Bailiff to 'The Agricultural Gazette.'

"I beg to send you my milk register for 1888 [see Table, p. 185], and had hoped for a rather better result, but the cold wet season was, no doubt, the chief cause of the shortness of yield.

"The cows had no artificial food whatever, but the two-year-olds have had 3 lbs. of mixed cake daily, as we keep them in milk longer than formerly, so as to keep up their condition.

"The cream test I took in the common tubes, and was very much surprised to note the differences in quantity. I allowed the milk to stand twelve hours, and found in some cases very little rose after the first hour. I only tested the cream once, the first week in August, excepting a few of the highest and lowest cases, but they varied a very small trifle. I trust some who sent records last year will do so again, for I feel interest in seeing other county dairy notes.

"S. Wright, *Bailiff,*" Cranmore Hall.

There is no pretension of novelty or of high science in the management of this farm, but, at the suggestion of Sir Thomas Acland, I now add some few additional details, and give a short account of the manner in which we carry on our agricultural operations.

I would premise that the land is all of a moderately good quality, and that the farm consists of—pasture, 172 acres; arable, 40 acres; total, 212 acres. One-half of the pasture is mowed each year; the arable is farmed on the ordinary four-course system. All the straw is chaffed for winter-feed, being mixed with hay, some brewers' grains, and a very little cake.

"A large proportion of grain grown on the farm is consumed n fatting pigs. We keep a boar and 5 breeding sows, and atted 68 pigs during the year 1888.

As a general rule, all the manure made on the farm, mixed h road-scrapings, &c., is used on the grass lands, which steadily improving under this treatment.

he arable is kept clean, and treated with moderate quan- artificial manures to suit crops.

t 100 lambs are bought each fall, to fold off with oots."

airy consists of about 46 cows—tidy-looking Short- none thoroughbred. We also keep about 10 yearlings,

No. of Cow.	Total quantity in gallons.	Highest quantity per day in gallons.	No. of weeks in milk.	Percentage of cream.	Age.
2	765	4½	50	6	cow.
4	483	4	32	4	„
5	653	4⅔	34	7	„
6	224	1⅓	26	13	2 yrs.
7	709	4	36	7	cow.
8	390	2	42	9	2 yrs.
9	263	2	30	14	„
10	848	5⅓	46	6	cow.
11	346	2	40	13	2 yrs.
12	721	3⅔	40	8	cow.
13	759	4	40	20	„
14	358	2½	38	2	2 yrs.
15	850	4½	42	4	cow.
16	663	4	40	9	„
17	544	2⅓	40	14	2 yrs.
18	366	1⅓	42	3	„
19	477	3	38	13	4 yrs.
20	437	3	40	9	cow.
21	515	3	34	13	4 yrs.
22	648	3	40	9	cow.
23	573	3	42	10	„
24	200	1⅓	32	11	3 yrs.
25	745	3⅔	44	9	cow.
26	718	4⅔	36	8	„
27	768	5⅔	36	11	„
28	331	2	34	9	2 yrs.
29	440	2⅓	32	9	„
30	841	4½	44	8	cow.
31	768	3½	46	8	„
32	737	4	42	6	„
33	343	2	30	5	2 yrs.
34	352	2½	30	10	3 yrs.
36	690	4⅓	34	8	cow.
39	571	2⅔	42	7	„
40	528	3	38	10	3 yrs.
44	443	2⅔	38	7	4 yrs.
45	624	3	38	10	cow.
46	958	4⅔	42	4	„
47	708	5⅓	34	8	„
49	681	4⅓	38	11	„
50	539	3⅔	34	6	„
51	345	3	30	11	3 yrs.
52	641	3⅓	46	10	cow.
56	706	3⅓	38	11	„
57	777	4	40	8	„

Total for 10	2-year olds ..	3,575 ..	average 357½	galls.
„ 4	3 „ ..	1,425 ..	„ 356¼	„
„ 3	4 „ ..	1,435 ..	„ 478⅓	„
„ 28	cows	19,581 ..	„ 699⅓	„

Grand total for 45 head, 26,016, average, 578 galls.

1886 .. ... average 605 galls. | 1887 .. .. 532 galls.

and rear annually about 10 calves; making, with 2 bulls, about 68 to 70 head of cattle.

The farm also keeps 5 horses, which are frequently hired out to the estate; and it supplies annually some 10 tons of best hay to the home stables.

"Experience has amply proved that paying cows must be hardy cattle and good milkers, and that, on our moderately good pastures, 600 feet above the sea-level, pedigree-cows do not pay.

"We keep a pure-bred bull, and never rear a heifer-calf, except from a thoroughly good milking dam of sound constitution."

Our Calves—Yearlings and Two-year-old Heifers—all get a little cake to keep them growing; they, as well as the older cows, stay out all the winter, except a few in-milk, which are housed at night. The oldest cows and worst milkers are weeded out annually.

After supplying the house with milk, cream, and butter, at market prices, and selling daily enough to meet the wants of labourers, the remainder of the milk is made, by a skilled dairymaid, into best Cheddar cheese. Our make of this during the past season has been about 7 tons. Our heaviest cheese weighed about 100 lbs.

The milk of each cow is weighed once a fortnight, evening and morning, and the yield per cow is computed from this fortnightly register.

Beyond wasting (?) a little money year by year in trying experiments, both on grass and arable, the farm is conducted on strict business principles.

There is but little profit to be made, at present prices, out of fatting pigs; 8*s.* 6*d.* a score leaves small margin; and profit, if any, must be looked for in the manure.

Lambs, at 38*s.* last autumn, were probably bought too dear to help the balance-sheet at Lady Day.

Yet, despite a very poor clover-crop, a failure in our wheat, and, say one-third of our crop of hay, "very indifferent," we hope to pay rent, rates, and taxes, and make a fair percentage on capital.

Much, however, must depend upon two factors at present unknown, viz.;—

What luck we have with our calves up to 31st March, and the price of stock at Lady Day, when the valuation for the year is made.

XV.—*Wheat Experiments*, 1888. *Report of the Experimental Committee.* By J. E. Knollys, Chairman.

The Wheat Experiments of 1888 were arranged with the object of bringing to the test of another year's experience the principal results obtained in the 1886 Experiments from the use of Artificial Manures on the Wheat Crop of that year.

The conclusions which were drawn from those Experiments were :—

I. That nitrate of soda and sulphate of ammonia had greater effect when combined with superphosphate than when used alone.

I.. That in 1886 nitrate of soda did slightly better than sulphate of ammonia.

III. That mineral superphosphate used alone had too small an effect on the wheat crop to make its use profitable.

And to these conclusions Dr. Voelcker added that, "after a good clover crop the application of artificial manures is unnecessary and unprofitable."

The Committee did not think it necessary to repeat the use of mineral superphosphate alone, the third conclusion drawn from the 1886 Experiments being so entirely confirmed by the Rothamsted and Woburn Experiments.

The scheme arranged therefore for the 1888 Experiments was as follows:—two plots, O and T, in each experimental field were left without manure, and the arrangement of the plots in every case was as in the following diagram :—

O.	P.	Q.	R.	S.	T.
No Manure.	1¼ cwt. Nitrate of Soda. 3 cwt. Mineral Superphosphate.	1 cwt. Sulphate of Ammonia. 3 cwt. Mineral Superphosphate.	1 cwt. Sulphate of Ammonia.	1¼ cwt. Nitrate of Soda.	No Manure.

But with a view of testing more particularly the value of clovers, both red and white, as a preparation for wheat, special information was sought as to the seeds sown forming the clover leys, and whether or not the red clovers had died out before these leys were ploughed for wheat.

Unfortunately the season of 1888 has been such as to render these inquiries as to clovers of comparatively little value, as well as to make many of our individual experiments unsatisfactory, though useful information is to be gathered from them when taken collectively.

Wheat sown on clover leys in the autumn of 1887 throughout the South and West of England, where the ley was simply ploughed down, lost plant very generally (whether destroyed by a small grub or not seems doubtful), and consequently in many cases the Experimental Plots were stocked unevenly, and a fair comparison of their produce thus prevented.

As the season went on, a violent storm of wind and rain in July laid and twisted the wheat where it was at all heavy, and continuous rains afterwards made matters worse. From these causes five of our Experiments had to be abandoned, and the wheat in several other cases was so injured, that the returns cannot be taken as an accurate comparison of the effects of the several manures.

Under these circumstances I think a juster and more instructive view of the effects of the several manures will be obtained if we look at the results in mass rather than in detail.

We started with 29 sets of Experiments. Of these, as above stated, 5 could not be brought to a conclusion. The Table on p. 189 shows the results of the remaining 24 sets of Experiments when taken collectively:—

From these figures it will be seen—

1. That nitrate of soda and sulphate of ammonia, when combined with superphosphate, have each given a larger produce both in corn and straw than either used alone.

II. That 1 cwt. of sulphate of ammonia and 1¼ cwt. of nitrate of soda produced as nearly as possible the same amount of corn.

III. That nitrate of soda, both in combination with superphosphate and when used alone, has given rather more straw than sulphate of ammonia used in the same manner.

The results, therefore, of the 1888 Experiments are in strong confirmation of the conclusions drawn from the Wheat Experiments of 1886.

These conclusions are so entirely in accord with the results obtained at Woburn as detailed by Sir John Lawes, in his valuable paper in the Royal Agricultural Society's 'Journal' of last April, that I think we may accept them as a guide to the *relative* effect of these manures upon a wheat crop.

But it must be borne in mind that the *actual amount of increase*

Collected Produce of the Twenty-four Sets of Experiments.

Average of O and T. No Manure. Head Corn.		Tail Corn.		Straw.			P. Nitrate of Soda with Mineral Superphosphate. Head Corn.		Tail Corn.		Straw.			Q. Sulphate of Ammonia with Mineral Superphosphate. Head Corn.		Tail Corn.		Straw.			R. Sulphate of Ammonia alone. Head Corn.		Tail Corn.		Straw.			S. Nitrate of Soda alone. Head Corn.		Tail Corn.		Straw.		
bus.	lbs.	bus.	lbs.	cwts.	qrs.	lbs.	bus.	lbs.	bus.	lbs.	cwts.	qrs.	lbs.	bus.	lbs.	bus.	lbs.	cwts.	qrs.	lbs.	bus.	lbs.	bus.	lbs.	cwts.	qrs.	lbs.	bus.	lbs.	bus.	lbs.	cwts.	qrs.	lbs.
585	50	84	7	653	2	11	646	22	105	3	782	1	26	642	18	102	11	735	1	16	608	43	101	44	728	0	5	606	17	103	36	738	1	3
Increase obtained by the use of the above Manures.																																		
..		..		..			60	32	20	46	128	3	15	56	28	18	4	81	3	5	22	53	17	37	74	1	22	20	27	19	29	84	2	20

Average Produce per Acre of the Twenty-four Experiments.

O and T. Head Corn.		Tail Corn.		Straw.			P. Head Corn.		Tail Corn.		Straw.			Q. Head Corn.		Tail Corn.		Straw.			R. Head Corn.		Tail Corn.		Straw.			S. Head Corn.		Tail Corn.		Straw.		
bus.	lbs.	bus.	lbs.	cwts.	qrs.	lbs.	bus.	lbs.	bus.	lbs.	cwts.	qrs.	lbs.	bus.	lbs.	bus.	lbs.	cwts.	qrs.	lbs.	bus.	lbs.	bus.	lbs.	cwts.	qrs.	lbs.	bus.	lbs.	bus.	lbs.	cwts.	qrs.	lbs.
24	25	3	25	27	0	26	26	56	4	19	32	2	12	26	46	4	13	30	2	16	25	22	4	12	30	1	10	25	16	4	16	30	3	1
Average Increase per Acre obtained by the use of Manures.																																		
..		..		..			2	31	0	44	5	1	14	2	21	0	38	3	1	18	0	57	0	37	3	0	12	0	51	0	41	3	2	3

which they may produce will be largely dependent on the state of the plant, the condition and previous cropping of the land, its freedom from weeds,* and last, but not least, the season.

In the season of 1888 the increase of produce has, in most cases, been insufficient to pay the cost of the manures, and farmers, if guided by the returns only of this year, will look with no favour on artificial manures for corn; the season has been exactly of the character described by Sir John Lawes, when, after explaining that nitrate of soda and salts of ammonia supply food for plants, he goes on to say:—

"Farmers, as a rule, describe nitrate of soda as a stimulant . . . perhaps they might give it a worse name than this if the application were followed by a cold, wet summer, and they found that their corn was overgrown and laid." †

Happily for us such seasons do not often occur. From a paper published by the Surveyor's Institution,‡ it appears that as regards the South of England the temperature of every one of the twelve months affecting the wheat crop of 1888, viz. the twelve months ending September, was below the average. In this respect the temperature of 1888 very much resembles that of 1816, the lowest of the three years which Sir John Lawes describes as the three worst wheat years of the present century, 1816, 1860, and 1879. Had it not been for a very favourable September the yield of the 1888 wheat crop would probably have been as low, if not lower than that of 1879.

In these Experiments we have not been able to advance, as was desired, our knowledge of the effect of alsike and white clovers in comparison with red clovers as a preparation for wheat; or the duration in the soil of the nitrogen derived from red clover after the plant has died; but at some future time it is hoped that the Committee will be able to go thoroughly into the question.

I have again to tender, on behalf of the Experimental Committee, my warm thanks to those gentlemen who have so kindly carried out these Experiments, and to express the hope that the Society and the country at large may continue to have the benefit of their valuable assistance.

On behalf of the Committee,

January, 1889. J. E. KNOLLYS, *Chairman.*

P.S.—It will be gratifying to the members of this Society to know that our Experimental Work has met with the approval of the Agricultural Department of Her Majesty's Privy Council, and that a grant has been made in aid of the expenses incurred.

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* See Experiment No. 21. † See p. 309 of the 'Journal.'

‡ Surveyor's Institution, Professional Notes, January, 1889.

I am indebted to Mr. Martin Sutton for the following very interesting statement of the effect upon trifolium in 1888, of the manures used in 1887 on his Experimental Plots of Barley.

It will be remembered that in our Barley Experiments one great point was to observe the effect of potash upon the barley crop. In Mr. Martin Sutton's Barley, the plots H and I, which received muriate of potash in addition to the other manures, showed some, though no very great, advantage over the others; but the potash seems to have told more on the trifolium than it did on the barley.

His statement is as follows:—

EARLY TRIFOLIUM after EXPERIMENTAL BARLEY, DYSON'S WOOD, OXON.

Manures for Barley in 1887. *No Manure for Trifolium in* 1888.

PLOT.	Manures applied in 1887, per Acre.	Green Trifolium, per Acre.				*Increase* of Trifolium, per Acre, by Manures applied in 1887.			
		tons	cwt.	qrs.	lbs.	tons	cwt.	qrs.	lbs.
H	1¼ cwt. Nitrate of Soda .. .. 2 cwt. Mineral Superphosphate ¾ cwt. Muriate of Potash ..	11	5	1	22	4	12	0	21
I	1 cwt. Sulphate of Ammonia .. 2 cwt. Mineral Superphosphate ¾ cwt. Muriate of Potash ..	9	10	1	17	2	17	0	16
K	No Manure..	6	13	1	1	..			
L	3 cwt. Peruvian Guano	8	0	1	27	1	7	0	26
M	1¼ cwt. Nitrate of Soda .. .. 2 cwt. Mineral Superphosphate	7	7	3	2	0	14	2	1
N	No Manure..	Not weighed. Very similar to Plot K				..			

The trifolium was all alike in appearance throughout the winter, but as soon as it started growing, commenced to show differently in the same order of excellence as above. Trifolium on adjoining farms is not good this year. H is so thick and heavy as to be a little lodged.

N.B.—Rye adjoining, cut green for fodder, showed no difference to the eye on the various plots.

This remarkable increase in trifolium in 1888 from potash applied in 1887 leads to the consideration whether our clover crops may not be improved and possibly rendered more certain by the use of potash, either singly or in combination with other manures, a subject which I hope we may be able to take up in our Experimental Work very shortly.

J. E. KNOLLYS.

STATEMENT giving NAMES of PERSONS by whom the WHEAT EXPERIMENTS, 1888, have been carried out, with DESCRIPTION and SITUATION of the EXPERIMENTAL PLOTS.

	Owners, Agents, or Occupiers.	Situation.	Soil.	Subsoil or Geological Formation.
		WESTERN AND SOUTH-WESTERN COUNTIES.		
		Cornwall.		
1	Sir T. D. Acland .. .. .. Mr. W. H. Tremaine	Trerice, St. Colomb	Stone Rush	Devonian
2	Mr. Magor	Benallock, Grampound Road ..	Light	Clay slate
3	Mr. Harris	Launcells, near Stratton	Peaty	Clay
		Devon.		
4	Sir T. D. Acland .. .. .. Mr. Stevens	Broad Clyst, near Exeter	Loam	New Red Sandstone
5	Sir John Shelley	Shobrooke, Crediton	Red marl	New Red Sandstone
6	Hon. Mark Rolle	Bicton, near Budleigh Salterton ..	Sandy loam	New Red Sandstone
		Somerset.		
7	Mr. Sellick	Brompton Ralph, Wiveliscombe	Blue Rag (Shillet)	Slate
8	Mr. S. Kidner	Near Milverton	Red marl	New Red Sandstone
9	Mr. John Kidner	Nynehead, Wellington	Medium, freeworking	Marl, New Red Sandstone
10	Mr. Gibbons	Tunley, Bath	Lias, fairly dry	Clay and stone
		Herefordshire.		
11	Mr. John Bennett	Near Ross	Sandy loam, dry	Red Sandstone or Dunstone
12	Mr. Bonnor	Near Ross	Sandy loam, dry	Red Sandstone
		Montgomeryshire.		
13	Mr. Naylor	Near Kerry	Loam	Clay, Upper Silurian.
		Gloucestershire.		
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]

SOUTHERN AND SOUTH-EASTERN COUNTIES.

16	Major Sparks	*Dorset.* Near Weymouth	Limestone	Clay
17	Mr. Besent	Kingston, near Blandford	Medium	Chalk
18	Mr. Storey-Maskelyne, M.P.	*Wilts.* Basset Down, Swindon	Marl	Grey chalk
19	Mr. Richards	Charlton, near Shaftesbury	Medium	Chalk
20	Messrs. C. and T. Coles	Edge of Salisbury Plain	Gravel	Chalk
21	Mr. Mark Wallis	Salisbury Plain, South	Flinty	Chalk
22	Mr. Tom Gray	Salisbury Plain, North	Light chalk	Chalk
23	Mr. Iremonger Mr. Studdy	*Hants.* Near Stockbridge	Gravel	Chalk
24	Mr. East Mr. Hewett	Near Stockbridge	Light chalk	Chalk
25	Mr. Benyon Mr. Todd	*Berks.* Englefield, near Reading	Heavy loam	Strong clay
26	Lord Wantage Mr. Eady	Ardington, near Wantage	Loam	Upper Greensand and gault
27	Mr. Stewart Hodgson Mr. Purkis	*Surrey.* Haslemere	Light and dry	Sandstone
28	Mr. Ashcroft	*Kent.* Hayes, near Beckenham	Medium with flint	Drift clay on chalk

WHEAT EXPERIMENTS, 1888.

No. 1.—AFTER FALLOW.—Sir T. D. ACLAND'S EXPERIMENTS, West Cornwall, near St. Columb.

Results, Calculated per Acre.

Plots.	How Manured.	Quantity per Acre.	Cost of Manure per Acre.	Produce in Grain per Acre.		Natural Weight of Bushel.	Produce in Straw per Acre.	Corn. Increase or Decrease as compared with Average of Plots O and T. Increase.	Corn. Decrease.	Straw. Increase or Decrease as compared with Average of Plots O and T. Increase.	Straw. Decrease.
		cwts.	£ s. d.		bus. lbs.	lbs.	cwts. qrs. lbs.	bus. lbs.	bus. lbs.	cwts. qrs. lbs.	cwts. qrs. lbs.
O	No Manure	..	..	Head Corn	18 14	57½	25 0 10	..	..	..	..
				Tail Corn	1 2	..		..	..		
P	Mineral Superphos. ..	3	1 1 0	Head Corn	22 44	58	30 1 14	7 18	..	7 3 23	..
	Nitrate of Soda	1¼		Tail Corn	1 14	..		0 15	..		
Q	Mineral Superphos. ..	3	1 1 0	Head Corn	21 46	58	30 0 2	6 20	..	7 2 11	..
	Sulphate of Ammonia	1		Tail Corn	1 18	..		0 19	..		
R	Sulphate of Ammonia	1	0 13 6	Head Corn	17 18	56½	25 3 8	1 48	..	3 1 17	..
				Tail Corn	1 49	..		0 15	..		
S	Nitrate of Soda	1¼	0 13 6	Head Corn	16 0	57	24 0 26	0 31	..	1 3 7	..
				Tail Corn	1 9	..		0 10	..		
T	No Manure	..	..	Head Corn	12 38	57	19 3 0	..	..	..	..
				Tail Corn	0 46	..		..	..		

Average of Plots O and T:—Head Corn, 15 bus. 26 lbs.; Tail Corn, 49 lbs.; Straw, 22 cwt. 1 qr. 19 lbs.

ABSTRACT OF PARTICULARS WITH REFERENCE TO EXPERIMENT No. 1,

Contained in Returns to Enquiries of Experimental Committee.

PREPARED BY THE CHAIRMAN.

Seed Wheat.— White Cambridge, $2\frac{1}{4}$ bushels, sown October 13th, 1887.

Application of Manures.—Mineral Superphosphate, January 11th; Sulphate of Ammonia and Nitrate of Soda, April 16th, left on the surface.

First Rains after Application of Manures.—January 17th, and April 17th.

Previous Cultivation.—1882, Wheat. 1883, Turnips. 1884, Barley. 1885, Seeds (viz. 6 lbs. Red Clover and Cow Grass; 2 lbs. White Clover; 2 lbs. Alsike; 10 gallons of common and Italian Rye Grass). 1886, 2nd year's seeds. 1887, Fallowed (all Clovers had died out).

Soil.—Stone Rush.—Light and dry.

Mr. Tremaine remarks that the season was very unfavourable, owing to so much rain in July; the ears of wheat about half filled, and the sample small and poor.

WHEAT EXPERIMENTS, 1888.

No. 2.—UPON LEY.—Mr. MAGOR'S EXPERIMENTS, Cornwall, near Grampound Road.

Results, Calculated per Acre.

Plots.	How Manured.	Quantity per Acre.	Cost of Manure per Acre.	Produce in Grain per Acre.		Natural Weight of Bushel.	Produce in Straw per Acre.	Corn. Increase or Decrease as compared with Average of Plots O and T. Increase.	Corn. Increase or Decrease as compared with Average of Plots O and T. Decrease.	Straw. Increase or Decrease as compared with Average of Plots O and T. Increase.	Straw. Increase or Decrease as compared with Average of Plots O and T. Decrease.
		cwts.	£ s. d.		bus. lbs.	lbs.	cwts. qrs. lbs.	bus. lbs.	bus. lbs.	cwts. qrs. lbs.	cwts. qrs. lbs.
O	No Manure	..	..	Head Corn	28 46	59	43 1 4	..	..	..	..
				Tail Corn	4 36	..		..	..		
P	Mineral Superphos. ..	3	1 1 0	Head Corn	36 46	57	55 1 4	6 56	..	14 3 0	..
	Nitrate of Soda	1¼		Tail Corn	2 4	..		..	2 2		
Q	Mineral Superphos. ..	3	1 1 0	Head Corn	29 15	59	40 1 10	..	0 32	..	0 0 22
	Sulphate of Ammonia	1		Tail Corn	5 42	..		1 36	..		
R	Sulphate of Ammonia	1	0 13 6	Head Corn	28 48	58	40 0 6	..	0 58	..	0 1 26
				Tail Corn	5 38	..		1 32	..		
S	Nitrate of Soda	1¼	0 13 6	Head Corn	28 58	59	43 1 4	..	0 48	2 3 0	..
				Tail Corn	4 32	..		0 26	..		
T	No Manure	..	..	Head Corn	30 48	59	37 3 6	..	..	..	..
				Tail Corn	3 28	..					

Average of Plots O and T:—Head Corn, 29 bus. 47 lbs.; Tail Corn, 4 bus. 6 lbs.: Straw, 40 cwt. 2 qrs. 4 lbs.

ABSTRACT OF PARTICULARS WITH REFERENCE TO EXPERIMENT No. 2,

Contained in Returns to Enquiries of Experimental Committee.

PREPARED BY THE CHAIRMAN.

Seed Wheat.—White, 2½ bushels, sown October 15th, 1887.

Application of Manures.—Mineral Superphosphates, October 16th, 1887, worked in. Sulphate Ammonia and Nitrate Soda, March 28th, clod-crushed and rolled.

First Rains after Application of Manures.—Within a week.

Previous Cultivation.—1882, Roots drawn off. 1883, Barley (2½ cwt. Guano), seeded with 3 lbs. Red Clover, 3 lbs. Cornish Clover, 2 lbs. White Clover, 2 lbs. Alsike, ½ bushel Devon Eaver (dunged in November). 1884, Seeds, fed off. 1885, 2nd year's Ley (dunged in February), fed off. 1886, 3rd year's Ley (3 cwt. Guano in April), mown for hay. 1887, 4th year's Ley (1½ cwt. Guano, 1 cwt. Nitrate Soda), mown for hay in June and then prepared for Wheat.

Soil.—Light and dry.

Mr. Magor says that the Wheat on Plot P ripened earliest, and was threshed about ten days before the other Plots, before the straw was thoroughly dry; he adds that Plot Q "was beaten with the weather the worst of all." The large difference between the produce of Plots P and Q, both in Corn and Straw, may thus be accounted for.

WHEAT EXPERIMENTS, 1888.

No. 3.—AFTER OATS.—Mr. HARRIS'S EXPERIMENTS, Cornwall, near Stratton.

Results, Calculated per Acre.

Plots.	How Manured.	Quantity per Acre.	Cost of Manure per Acre.	Produce in Grain per Acre.		Natural Weight of Bushel.	Produce in Straw per Acre.	Corn. Increase or Decrease as compared with Average of Plots O and T. Increase.	Corn. Decrease.	Straw. Increase or Decrease as compared with Average of Plots O and T. Increase.	Straw. Decrease.
		cwts.	£ s. d.		bus. lbs.	lbs.	cwts. qrs. lbs.	bus. lbs.	bus. lbs.	cwts. qrs. lbs.	cwts. qrs. lbs.
O	No Manure	..	..	Head Corn Tail Corn	6 18 0 35	56½ ..	8 2 20	.. ..	.. ..	..	..
P	Mineral Superphos. .. Nitrate of Soda	3 1½	1 1 0	Head Corn Tail Corn	8 9 0 40	58½ ..	9 3 21	2 31 0 7	.. ..	1 2 21	..
Q	Mineral Superphos. .. Sulphate of Ammonia	3 1	1 1 0	Head Corn Tail Corn	5 36 0 30	56½ ..	7 3 9	.. ..	.. 0 3	..	0 1 19
R	Sulphate of Ammonia	1	0 13 6	Head Corn Tail Corn	4 8 0 32	57 ..	6 3 0	.. ..	1 28 0 1	..	1 2 0
S	Nitrate of Soda	1½	0 13 6	Head Corn Tail Corn	6 3 0 40	58 ..	9 3 19	0 25 0 7	.. ..	1 2 19	..
T	No Manure	..	..	Head Corn Tail Corn	4 55 0 32	56 ..	7 3 8	.. ..	.. ..	..	..

Average of Plots O and T:—Head Corn, 5 bus. 36 lbs.; Tail Corn, 33 lbs.; Straw, 8 cwt. 1 qr.

ABSTRACT OF PARTICULARS WITH REFERENCE TO EXPERIMENT No. 3,

Contained in Returns to Enquiries of Experimental Committee.

PREPARED BY THE CHAIRMAN.

Seed Wheat.—Red, 2 bushels, sown November 1st, 1887.

Application of Manures.—Mineral Superphosphate, December 1st, 1887. Sulphate Ammonia and Nitrate Soda, April 19th. All left on the surface.

Previous Cultivation.—1887, Oats (Mineral Superphosphate) after 4 year's Ley. Oat stubble cleaned and sown to Wheat.

Soil.—Wet peaty soil on clay.

This was an experiment as to the effect of manures upon land, which neither from its state, character of soil or climate, could be considered suited for the growth of Wheat. The small produce obtained confirms previous experience, and shows that it is more adapted to the growth of Oats, of which Mr. Harris states 48 bushels were grown on an adjoining acre dressed with 4 cwt. of Superphosphate only.

WHEAT EXPERIMENTS, 1888.

…ON LEY.—SIR T. D. ACLAND'S EXPERIMENTS, DEVONSHIRE, NEAR EXETER.

RESULTS, CALCULATED PER ACRE.

Plots.	How Manured.	Quantity per Acre.	Cost of Manure per Acre.	Produce in Grain per Acre.			Natural Weight of Bushel.	Produce in Straw per Acre.			Corn. Increase or Decrease as compared with Average of Plots O and T. Increase.		Decrease.		Straw. Increase or Decrease as compared with Average of Plots O and T. Increase.			Decrease.		
		cwts.	£ s. d.		bus.	lbs.	lbs.	cwts.	qrs.	lbs.	bus.	lbs.	bus.	lbs.	cwts.	qrs.	lbs.	cwts.	qrs.	lbs.
O.	No Manure..	..	..	Head Corn	29	26	58	32	0	14	..		..			..			..	
				Tail Corn	2	0	..				..		..							
P	Mineral Superphos. ..	3	1 1 0	Head Corn	31	13	59	35	1	26	0	42	..		4	2	15		..	
	Nitrate of Soda	1¼		Tail Corn	2	18	..				0	24	..							
Q	Mineral Superphos. ..	3	1 1 0	Head Corn	32	0	59	35	2	4	1	29	..		4	2	21		..	
	Sulphate of Ammonia	1		Tail Corn	2	14	..				0	20	..							
R	Sulphate of Ammonia	1	0 13 6	Head Corn	34	37	57½	34	2	24	4	7	..		3	3	13		..	
				Tail Corn	2	20	..				0	26	..							
S	Nitrate of Soda	1¼	0 13 6	Head Corn	31	47	58½	33	1	24	1	17	..		2	2	13		..	
				Tail Corn	2	21	..				0	27	..							
T	No Manure	..	..	Head Corn	31	35	59	29	2	8	..		..			..			..	
				Tail Corn	1	39	..				..		..							

Average of Plots O and T:—Head Corn, 30 bus. 30 lbs.; Tail Corn, 1 bus. 44 lbs.; Straw, 30 cwts. 3 qrs. 11 lbs.

ABSTRACT OF PARTICULARS WITH REFERENCE TO EXPERIMENT No. 4.

Contained in Returns to Enquiries of Experimental Committee.

PREPARED BY THE CHAIRMAN.

Seed Wheat.—White, Long Buff, 2 bushels, sown November 26th, 1887.

Application of Manures.—Mineral Superphosphate, November 26th, 1887. Sulphate Ammonia and Nitrate Soda, April 4th. All harrowed in.

First Rains after Application of Manures.—Slight snow on the 4th and 8th, and rain on April 17th.

Previous Cultivation.—1883, Ley. 1884, Wheat. 1885, Swedes, ¼ drawn off (10 loads dung, 2 cwt. dissolved bones, 3 cwt. Superphosphate). 1886, Barley. 1887, Seeds (viz. 5¼ lbs. Red Clover, 1¼ lbs. White Clover, 2 lbs. Alsike, 1¼ lbs. Trefoil, 2 pecks Rye Grasses), dunged in Winter; mown for hay.

Soil.—Deep sandy loam.

Mr. Stevens remarks upon the injury done to the crop by the July rains, and the rust which followed.

WHEAT EXPERIMENTS, 1888.

No. 4d.—UPON LEY.—Sir T. D. ACLAND'S EXPERIMENTS, Devonshire, near Exeter.

Results, Calculated per Acre.

Plots.	How Manured.	Quantity per Acre.	Cost of Manure per Acre.	Produce in Grain per Acre.		Natural Weight of Bushel.	Produce in Straw per Acre.	Corn. Increase or Decrease as compared with Average of Plots O and T. Increase.	Corn. Decrease.	Straw. Increase or Decrease as compared with Average of Plots O and T. Increase.	Straw. Decrease.
		cwts.	£ s. d.		bus. lbs.	lbs.	cwts. qrs. lbs.	bus. lbs.	bus. lbs.	cwts. qrs. lbs.	cwts. qrs. lbs.
O	No Manure	..	..	Head Corn Tail Corn	30 45 1 36	58½ ..	29 0 4	.. ..	.. ..	..	..
P	Mineral Superphos. .. Nitrate of Soda	3 1¼	1 1 0	Head Corn Tail Corn	33 3 2 37	58½ ..	35 2 4	6 30 0 30	.. ..	6 2 6	..
Q	Mineral Superphos. .. Sulphate of Ammonia	3 1	1 1 0	Head Corn Tail Corn	29 42 2 17	58 ..	31 3 6	3 11 0 10	.. ..	2 3 8	..
R	Sulphate of Ammonia	1	0 13 6	Head Corn Tail Corn	28 38 2 27	58½ ..	31 3 4	2 7 0 20	.. ..	2 3 6	..
S	Nitrate of Soda	1¼	0 13 6	Head Corn Tail Corn	28 0 2 44	58 ..	34 2 16	1 27 0 37	.. ..	5 2 18	..
T	No Manure	..	..	Head Corn Tail Corn	22 17 2 29	58½ ..	28 3 20	.. ..	.. ..	..	..

Average of Plots O and T:—Head Corn, 26 bus. 31 lbs.; Tail Corn, 2 bus. 7 lbs.; Straw, 28 cwts. 3 qrs. 26 lbs.

ABSTRACT OF PARTICULARS WITH REFERENCE TO EXPERIMENT No. 4d.

Contained in Returns to Enquiries of Experimental Committee.

Prepared by the Chairman.

For previous cultivation and particulars, see No. 4.

These Experimental Plots are duplicates immediately adjoining those of No. 4; but Mr. Stevens says that the plant of Wheat was a little uneven in the Plots R, S, and T, which accounts for their lower produce, and the consequent lower average of the two unmanured Plots O and T.

WHEAT EXPERIMENTS, 1888.

…UPON LEY.—Sir JOHN SHELLEY'S EXPERIMENTS, Devonshire, near Crediton.

Results, Calculated per Acre.

Plots.	How Manured.	Quantity per Acre.	Cost of Manure per Acre.	Produce in Grain per Acre.			Natural Weight of Bushel.	Produce in Straw per Acre.			Corn. Increase or Decrease as compared with Average of Plots O and T. Increase.		Corn. Decrease.		Straw. Increase or Decrease as compared with Average of Plots O and T. Increase.			Straw. Decrease.		
		cwts.	£ s. d.		bus.	lbs.	lbs.	cwts.	qrs.	lbs.	bus.	lbs.	bus.	lbs.	cwts.	qrs.	lbs.	cwts.	qrs.	lbs.
O	No Manure	..	..	Head Corn	24	45	60½	23	1	12	..		..			..			..	
				Tail Corn	2	27	..				..		..							
P	Mineral Superphos. ..	3	1 1 0	Head Corn	27	15	59½	29	1	18	4	52	..		8	1	11		..	
	Nitrate of Soda	1¼		Tail Corn	4	13	..				1	5	..							
Q	Mineral Superphos. ..	3	1 1 0	Head Corn	28	19	58¾	26	3	21	5	56	..		5	3	14		..	
	Sulphate of Ammonia	1		Tail Corn	4	46	..				1	38	..							
R	Sulphate of Ammonia	1	0 13 6	Head Corn	28	0	57⅓	27	2	17	5	35	..		6	2	10		..	
				Tail Corn	4	30	..				1	22	..							
S	Nitrate of Soda	1¼	0 13 6	Head Corn	25	0	56½	27	0	5	2	34	..		5	3	26		..	
				Tail Corn	5	28	..				2	20	..							
T	No Manure	..	..	Head Corn	20	0	58¾	18	3	3	..		..			..			..	
				Tail Corn	3	39	..				..		..							

Average of Plots O and T:—Head Corn, 22 bus. 22 lbs.; Tail Corn, 3 bus. 8 lbs.; Straw, 21 cwts. 0 qr. 7 lbs.

ABSTRACT OF PARTICULARS WITH REFERENCE TO EXPERIMENT No. 5,

Contained in Returns to Enquiries of Experimental Committee.

PREPARED BY THE CHAIRMAN.

Seed Wheat.—Giant White, $1\frac{3}{4}$ bushels, sown October 10th, 1887.

Application of Manures.—Mineral Superphosphate, November 16th, 1887, left on surface. Sulphate Ammonia and Nitrate Soda, March 24th, rolled in.

First Rains after Application of Manures.—Heavy rain during night of March 24th, and continuous rains till March 30th.

Previous Cultivation.—1881, Turnips, fed off by sheep with cake and corn. 1882, Barley, seeded with Sutton's One-year's Clover and Grass Mixture. 1883, Seeds, cut for hay. 1884, Wheat (no manure). 1885, part Swedes, small crop; part Vetches; both fed off by sheep with cake and corn. 1886, Barley, sown with Sutton's One-year's Mixture. 1887, Seeds, cut for hay (no manure).

Soil.—Red Sandstone, with patches of Clay Marl.

Sir John Shelley speaks of the damage done by rain and storms to this crop, and that the unmanured Plots were, as might be expected, not so much laid as those receiving manure.

WHEAT EXPERIMENTS, 1888.

—UPON LEY.—HON. MARK ROLLE'S EXPERIMENTS, EAST DEVON, BICTON.

RESULTS, CALCULATED PER ACRE.

Plots.	How Manured.	Quantity per Acre.	Cost of Manure per Acre.	Produce in Grain per Acre.			Natural Weight of Bushel.	Produce in Straw per Acre.			Corn. Increase or Decrease as compared with Average of Plots O and T. Increase.		Corn. Decrease.		Straw. Increase or Decrease as compared with Average of Plots O and T. Increase.			Straw. Decrease.		
		cwts.	£ s. d.		bus.	lbs.	lbs.	cwts.	qrs.	lbs.	bus.	lbs.	bus.	lbs.	cwts.	qrs.	lbs.	cwts.	qrs.	lbs.
O and T	No Manure	..	..	Head Corn	30	0	61	34	1	20	..		..		..			..		
				Tail Corn	0	20	..				..		..							
P	Mineral Superphos. ..	3	1 1 0	Head Corn	22	0	60½	30	1	0	7	0	..		13	0	4	..		
	Nitrate of Soda	1¼		Tail Corn	1	26	..				1	16	..							
Q	Mineral Superphos. ..	3	1 1 0	Head Corn	19	8½	59½	25	1	26	4	8	..		8	1	2	..		
	Sulphate of Ammonia	1		Tail Corn	0	32	..				0	22	..							
R	Sulphate of Ammonia	1	0 13 6	Head Corn	21	24½	59½	29	2	0	6	24	..		12	1	4	..		
				Tail Corn	1	14	..				1	4	..							
S	Nitrate of Soda	1¼	0 13 6	Head Corn	22	0	59½	26	1	24	7	0	..		9	1	0	..		
				Tail Corn	1	22	..				1	12	..							

Average of Plots O and T:—Head Corn, 15 bus.; Tail Corn, 10 lbs.; Straw, 17 cwt. 0 qr. 24 lbs.

ABSTRACT OF PARTICULARS WITH REFERENCE TO EXPERIMENT No. 6,

Contained in Returns to Enquiries of Experimental Committee.

PREPARED BY THE CHAIRMAN.

Seed Wheat.—White, 2¼ pecks, sown January 17th.

Application of Manures.—Mineral Superphosphate, Sulphate Ammonia and Nitrate Soda, on April 28th, worked in.

First Rains after Application of Manures.—April 30th and May 2nd.

Previous Cultivation.—1883, Turnips (dissolved bone). 1884, Wheat. 1885, Mangold (Lime and earth, upon 2 acres running across the Experimental Plots), dunged. 1886, Barley, seeded with 8 lbs. Red Clover, 3 lbs. Trefoil, 1 peck Devon Eaver, 1 peck Italian Rye Grass. 1887, Seeds, mown for hay and afterwards ploughed up for turnips, which failed, owing to the dry season.

Soil.—Loam on Sandstone.

The rainfall in this district in July amounted to 5·14.

WHEAT EXPERIMENTS, 1888.

N[illegible] . . TER FLAX UPON LEY.—MR. SELLICK'S EXPERIMENTS, WEST SOMERSET, NEAR WIVELISCOMBE.

RESULTS, CALCULATED PER ACRE.

Plots.	How Manured.	Quantity per Acre.	Cost of Manure per Acre.	Produce in Grain per Acre.		Natural Weight of Bushel.	Produce in Straw per Acre.	Corn. Increase or Decrease as compared with Average of Plots O and T. Increase.	Corn. Decrease.	Straw. Increase or Decrease as compared with Average of Plots O and T. Increase.	Straw. Decrease.
		cwts.	£ s. d.		bus. lbs.	lbs.	cwts. qrs. lbs.	bus. lbs.	bus. lbs.	cwts. qrs. lbs.	cwts. qrs. lbs.
O	No Manure	..	..	Head Corn	25 19	60	30 2 9	..	..	..	..
				Tail Corn	3 37	..		..	..		
P	Mineral Superphos. ..	3	1 1 0	Head Corn	29 11	61	35 2 21	4 33	..	5 1 19	..
	Nitrate of Soda	1¼		Tail Corn	4 26	..		0 48	..		
Q	Mineral Superphos. ..	3	1 1 0	Head Corn	28 6	61	35 0 0	3 28	..	4 2 23	..
	Sulphate of Ammonia	1		Tail Corn	4 16	..		0 38	..		
R	Sulphate of Ammonia	1	0 13 6	Head Corn	26 14	60	32 0 20	1 35	..	1 3 15	..
				Tail Corn	4 12	..		0 34	..		
S	Nitrate of Soda	1¼	0 13 6	Head Corn	25 27	60	31 2 0	0 48	..	1 0 23	..
				Tail Corn	4 12	..		0 34	..		
T	No Manure	..	..	Head Corn	24 0	60	30 0 2	..	..	..	..
				Tail Corn	3 19	..		..	..		

Average of Plots O and T:—Head Corn, 24 bus. 39 lbs.; Tail Corn, 3 bus. 28 lbs.; Straw, 30 cwt. 1 qr. 5 lbs.

ABSTRACT OF PARTICULARS WITH REFERENCE TO EXPERIMENT No. 7,

Contained in Returns to Enquiries of Experimental Committee.

PREPARED BY THE CHAIRMAN.

Seed Wheat.—White, Short-eared Essex, 2¼ bushels, sown November 16th, 1887.

Application of Manures.—Mineral Superphosphate, January 11th; Sulphate Ammonia and Nitrate Soda, April 14th; left on surface.

First Rains after Application of Manures.—April 17th.

Previous Cultivation.—1883, Wheat. 1884, Turnips (3 cwt. Nitro-phosphate), fed off without corn or cake. 1885, Barley, seeded with 4 lbs. Red Clover, 4 lbs. White Clover, 4 lbs. Alsike, 3 lbs. Trefoil, 2 pecks Italian Rye Grass (dunged in autumn). 1886, Seeds, mown for hay. 1887, Flax, followed by light crop of Mustard (no manure).

Soil.—Blue Rag on Slate.

Mr. Sellick remarks on the want of sun and the heavy rains in July all tending to make the season unfavourable, and reduce the yield of Wheat. In addition to the results obtained from the manures, this experiment is interesting, as the Wheat was preceded by a crop of Flax.

WHEAT EXPERIMENTS, 1888.

No. 8.—UPON LEY.—Mr. S. KIDNER'S EXPERIMENTS, West Somerset, near Milverton.

Results, Calculated per Acre.

Plots.	How Manured.	Quantity per Acre.	Cost of Manure per Acre.	Produce in Grain per Acre.		Natural Weight of Bushel.	Produce in Straw per Acre.	Corn. Increase or Decrease as compared with Average of Plots O and T. Increase.	Corn. Increase or Decrease as compared with Average of Plots O and T. Decrease.	Straw. Increase or Decrease as compared with Average of Plots O and T. Increase.	Straw. Increase or Decrease as compared with Average of Plots O and T. Decrease.
		cwts.	£ s. d.		bus. lbs.	lbs.	cwts. qrs. lbs.	bus. lbs.	bus. lbs.	cwts. qrs. lbs.	cwts. qrs. lbs.
O	No Manure	..	..	Head Corn	31 56	60	35 0 1	..	..	..	..
				Tail Corn	1 22	..		..	..		
P	Mineral Superphos. ..	3	1 1 0	Head Corn	34 20	60	42 2 5	2 15	..	5 3 1	..
	Nitrate of Soda	1¼		Tail Corn	2 28	..		1 10	..		
Q	Mineral Superphos. ..	3	1 1 0	Head Corn	38 30	60	45 2 8	6 25	..	8 3 4	..
	Sulphate of Ammonia	1		Tail Corn	2 2	..		0 34	..		
R	Sulphate of Ammonia	1	0 13 6	Head Corn	34 20	60	41 3 16	2 15	..	5 0 12	..
				Tail Corn	2 10	..		0 42	..		
S	Nitrate of Soda	1¼	0 13 6	Head Corn	36 50	60	44 3 23	4 45	..	8 0 19	..
				Tail Corn	1 23	..		0 5	..		
T	No Manure	..	..	Head Corn	32 14	61	38 2 8	..	..	..	..
				Tail Corn	1 15	..		..	..		

Average of Plots O and T:—Head Corn, 32 bus. 5 lbs.; Tail Corn, 1 bus. 18 lbs.; Straw, 36 cwt. 3 qrs. 4 lbs.

ABSTRACT OF PARTICULARS WITH REFERENCE TO EXPERIMENT No. 8,

Contained in Returns to Enquiries of Experimental Committee.

PREPARED BY THE CHAIRMAN.

Seed Wheat.—Oakshott's Champion, 2 bushels, sown October 14th, 1887.

Application of Manures.—Mineral Superphosphate, October, 1887, left on surface. Sulphate Ammonia and Nitrate Soda, April 1888, worked in.

First Rains after Application of Manures.—Within a week.

Previous Cultivation.—1883, Beans. 1884, Wheat (6 cwt. dissolved bones). 1885, Beans. 1886, Wheat (6 cwt. dissolved bones), sown with 12 lbs. per acre Perennial Red Clover. 1887, Clover, cut for hay and again for seed (no manure).

Soil.—Red Marl.

This fine crop of Wheat was much twisted and laid by the great storm of July 16th.

WHEAT EXPERIMENTS, 1888.

[illegible] LEY.—MR. JOHN KIDNER'S EXPERIMENTS, WEST SOMERSET, NEAR WELLINGTON.

RESULTS, CALCULATED PER ACRE.

Plots.	How Manured.	Quantity per Acre.	Cost of Manure per Acre.	Produce in Grain per Acre.		Natural Weight of Bushel.	Produce in Straw per Acre.	Corn. Increase or Decrease as compared with Average of Plots O and T. Increase.	Corn. Increase or Decrease as compared with Average of Plots O and T. Decrease.	Straw. Increase or Decrease as compared with Average of Plots O and T. Increase.	Straw. Increase or Decrease as compared with Average of Plots O and T. Decrease.
		cwts.	£ s. d.		bus. lbs.	lbs.	cwts. qrs. lbs.	bus. lbs.	bus. lbs.	cwts. qrs. lbs.	cwts. qrs. lbs.
O	No Manure	..	..	Head Corn	..	..	..	..	..	..	..
				Tail Corn							
P	Mineral Superphos. ..	3	1 1 0	Head Corn	24 40	60	31 1 20	..	2 0	..	0 2 24
	Nitrate of Soda	1¼		Tail Corn	5 0	..		..	..		
Q	Mineral Superphos. ..	3	1 1 0	Head Corn	29 20	60	33 2 8	2 40	..	1 1 20	..
	Sulphate of Ammonia	1		Tail Corn	5 0	..		..	..		
R	Sulphate of Ammonia	1	0 13 6	Head Corn	22 0	60	30 0 0	..	4 40	..	2 0 16
				Tail Corn	5 0	..		..	..		
S	Nitrate of Soda	1¼	0 13 6	Head Corn	18 40	60	25 0 0	..	8 0	..	7 0 16
				Tail Corn	5 0	..		..	..		
T	No Manure	..	..	Head Corn	26 40	60	32 0 16	..	..	..	..
				Tail Corn	5 0	..		..	..		

Plot T taken as the average.

ABSTRACT OF PARTICULARS WITH REFERENCE TO EXPERIMENT No. 9,

Contained in Returns to Enquiries of Experimental Committee.

PREPARED BY THE CHAIRMAN.

Seed Wheat.—White, 6½ pecks, sown November 17th, 1887.

Application of Manures.—Mineral Superphosphate, harrowed in with seed; Sulphate Ammonia and Nitrate Soda, March 13th.

First Rains after Application of Manures.—March 14th and 15th.

Previous Cultivation.—1883, Clover Ley. 1884, Wheat. 1885, Mangold (heavy dressing of dung, dissolved bones and Nitrate Soda). 1886, Wheat, seeded with 4 lbs. Perennial Red Clover, 2 lbs. White Clover, 2 lbs. Alsike, 1 lb. Trefoil, 2 pecks Rye Grasses. 1887, Seeds, mown for hay.

Soil.—Red Sand on Marl.

The Wheat in this field lost plant in the autumn, making the crop on the different Plots irregular. In Plot O the plant entirely failed. The Wheat on the other Plots varied in thickness, and some Plots were more damaged than others by the July storm, and the rust which followed it; and though great pains have been taken, the results obtained cannot be regarded as strictly indicating the effects of the several manures.

WHEAT EXPERIMENTS, 1888.

No. 10.—AFTER GREEN CROP.—Mr. GEORGE GIBBONS'S EXPERIMENTS, East Somerset, near Bath.

Results, Calculated per Acre.

Plots.	How Manured.	Quantity per Acre.	Cost of Manure per Acre.	Produce in Grain per Acre.		Natural Weight of Bushel.	Produce in Straw per Acre.	Corn. Increase or Decrease as compared with Average of Plots O and T. Increase.	Corn. Decrease.	Straw. Increase or Decrease as compared with Average of Plots O and T. Increase.	Straw. Decrease.
		cwts.	£ s. d.		bus. lbs.	lbs.	cwts. qrs. lbs.	bus. lbs.	bus. lbs.	cwts. qrs. lbs.	cwts. qrs. lbs.
O	No Manure	..	..	Head Corn	31 12½	56½	45 0 0	..	..	..	..
				Tail Corn	6 29	..		..	..		
P	Mineral Superphos. ..	3	1 1 0	Head Corn	29 34	56¼	52 0 0	..	1 12	5 0 14	..
	Nitrate of Soda	1½		Tail Corn	7 25½	..		0 48	..		
Q	Mineral Superphos. ..	3	1 1 0	Head Corn	32 55½	56¼	52 0 0	2 9	..	5 0 14	..
	Sulphate of Ammonia	1		Tail Corn	5 4½	..		..	1 23		
R	Sulphate of Ammonia	1	0 13 6	Head Corn	29 6½	55½	55 0 0	..	1 40	8 0 14	..
				Tail Corn	6 35½	..		0 8	..		
S	Nitrate of Soda	1½	0 13 6	Head Corn	28 11¾	55	49 0 0	..	2 34	2 0 14	..
				Tail Corn	5 29	..		..	0 48		
T	No Manure	..	..	Head Corn	30 23	57	48 3 0	..	..	..	..
				Tail Corn	6 26	..		..	..		

Average of Plots O and T:—Head Corn, 30 bus. 46 lbs.; Tail Corn, 6 bus. 27 lbs.; Straw, 46 cwt. 3 qrs. 14 lbs.

ABSTRACT OF PARTICULARS WITH REFERENCE TO EXPERIMENT No. 10,

Contained in Returns to Enquiries of Experimental Committee.

PREPARED BY THE CHAIRMAN.

Seed Wheat.—Red, 2 bushels, sown in November.

Application of Manures.—Mineral Superphosphate in February, rolled in. Sulphate Ammonia and Nitrate Soda in May.

First Rains after Application of Manures.—Three days after application.

Previous Cultivation.—Old Turf, producing no useful herbage, broken and sown with oats in 1886. In Green Crops of various kinds in 1887.

Soil.—Clay on Lias.

Mr. Gibbons says that "the Wheat in all the Plots looked most promising until the end of July, when it gradually became a dull, leaden colour, rusted and blighted on every Plot, but standing up well to the last." It should be observed that this Wheat was grown upon land broken up from old turf in 1886, and this probably accounts for the high produce in grain of the unmanured, as compared with the manured Plots. The land itself is 450 feet above sea-level, and naturally poor and thin.

WHEAT EXPERIMENTS, 1888.

·ʰᴜN LEY.—Mr. JOHN BENNETT'S EXPERIMENTS, Herefordshire, near Ross.

Results, Calculated per Acre.

Plots.	How Manured.	Quantity per Acre.	Cost of Manure per Acre.	Produce in Grain per Acre.			Natural Weight of Bushel.	Produce in Straw per Acre.	Corn. Increase or Decrease as compared with Average of Plots O and T. Increase.	Corn. Decrease.	Straw. Increase or Decrease as compared with Average of Plots O and T. Increase.	Straw. Decrease.
		cwts.	£ s. d.		bus.	lbs.	lbs.	cwts. qrs. lbs.	bus. lbs.	bus. lbs.	cwts. qrs. lbs.	cwts. qrs. lbs.
O	No Manure	..	..	Head Corn	26	52	60	18 1 23	..	..	..	..
				Tail Corn	2	6	..		..	..		
P	Mineral Superphos. ..	3	1 1 0	Head Corn	26	0	59	20 2 15	..	0 53	2 0 5	..
	Nitrate of Soda	1¼		Tail Corn	3	21	..		1 16	..		
Q	Mineral Superphos. ..	3	1 1 0	Head Corn	24	24	61	20 3 23	..	2 29	2 1 13	..
	Sulphate of Ammonia	1		Tail Corn	4	10	..		2 5	..		
R	Sulphate of Ammonia	1	0 13 6	Head Corn	25	56	62	20 0 24	..	0 57	1 2 14	..
				Tail Corn	3	46	..		1 41	..		
S	Nitrate of Soda	1¼	0 13 6	Head Corn	23	38	62	20 3 16	..	3 15	2 1 6	..
				Tail Corn	4	32	..		2 27	..		
T	No Manure	..	..	Head Corn	26	54	60	18 2 26	..	..	..	..
				Tail Corn	2	5	..		..	..		

Average of Plots O and T:—Head Corn, 26 bus. 53 lbs.; Tail Corn, 2 bus. 5 lbs.; Straw, 18 cwts. 2 qrs. 10 lbs.

ABSTRACT OF PARTICULARS WITH REFERENCE TO EXPERIMENT No. 11,

Contained in Returns to Enquiries of Experimental Committee.

PREPARED BY THE CHAIRMAN.

Seed Wheat.—Red and White, mixed, 2¼ bushels, sown November 30th, 1887.

Application of Manures.—Mineral Superphosphate, November 30th; Sulphate Ammonia, April 25th, Nitrate Soda, May 14th; all harrowed in.

First Rains after Application of Manures.—May 1st and June 5th.

Previous Cultivation.—1880, Wheat on Ley (dunged). 1881, Barley. 1882, Barley (special manure). 1883, Roots, damaged by "finger and toe" (special manure). 1884, Barley. 1885, Turnips, damaged by "finger and toe" (Mineral Superphosphate and bones). 1886, Barley (limed), seeded with 10 lbs. Perennial Red Clover, 3 lbs. White Clover, 3 lbs. Alsike, 1 peck Rye Grass. 1887, Seeds, mown twice (no manure).

Soil.—Red Sandstone.

It will be observed in this Experiment that in each of the manured Plots the head corn is less in amount than the average of the unmanured Plots; the only increase in grain being in the tail corn. This result may be distinctly traced to the effect of the July rains, which in that district were exceptionally disastrous, and, as might be expected, damaged the manured Plots the most, in which, as will be seen, the crops of straw were the largest.

WHEAT EXPERIMENTS, 1888.

UPON LEY.—Mr. W. V. BONNOR'S EXPERIMENTS, Herefordshire, near Ross.

Results, Calculated per Acre.

	How Manured.	Quantity per Acre.	Cost of Manure per Acre.	Produce in Grain per Acre.		Natural Weight of Bushel.	Produce in Straw per Acre.	Corn. Increase or Decrease as compared with Average of Plots O and T. Increase.	Corn. Decrease.	Straw. Increase or Decrease as compared with Average of Plots O and T. Increase.	Straw. Decrease.
		cwts.	£ s. d.		bus. lbs.	lbs.	cwts. qrs. lbs.	bus. lbs.	bus. lbs.	cwts. qrs. lbs.	cwts. qrs. lbs.
O	No Manure	..	..	Head Corn	26 44	62	20 2 4	..	..	..	..
				Tail Corn	3 4	..		..	..		
P	Mineral Superphos. ..	3	1 1 0	Head Corn	24 50	61	21 0 21	..	1 53	2 0 19	..
	Nitrate of Soda	1¼		Tail Corn	4 37	..		1 32	..		
Q	Mineral Superphos. ..	3	1 1 0	Head Corn	24 0	62	18 0 0	..	2 40	..	1 0 2
	Sulphate of Ammonia	1		Tail Corn	3 10	..		0 5	..		
R	Sulphate of Ammonia	1	0 13 6	Head Corn	24 32	63	18 3 8	..	2 8	..	0 0 22
				Tail Corn	3 11	..		0 6	..		
S	Nitrate of Soda	1¼	0 13 6	Head Corn	28 41	62	22 0 0	2 1	..	2 3 26	..
				Tail Corn	4 10	..		1 5	..		
T	No Manure	..	..	Head Corn	26 36	63	17 2 0	..	..	..	..
				Tail Corn	3 6	..		..	..		

Average of Plots O and T:—Head Corn, 26 bus. 40 lbs.; Tail Corn, 3 bus. 5 lbs.; Straw, 19 cwts. 0 qr. 2 lbs.

ABSTRACT OF PARTICULARS WITH REFERENCE TO EXPERIMENT No. 12,

Contained in Returns to Enquiries of Experimental Committee.

PREPARED BY THE CHAIRMAN.

Seed Wheat.—Golden Drop and White, mixed, 2⅓ bushels, sown November 10th, 1887.

Application of Manures.—Mineral Superphosphate, February 10th; Sulphate Ammonia and Nitrate Soda, May 5th; harrowed in and rolled.

First Rains after Application of Manures.—February 11th and May 10th.

Previous Cultivation.—1883, Clover (dunged). 1884, Wheat. 1885, Swedes (¼-inch bones and Superphosphate), fed off. 1886, Barley, seeded with 10 lbs. Red Clover, 2 lbs. White Clover, 2 lbs. Trefoil, 1 peck Rye Grass. 1887, Seeds (Clover partly died out).

Soil.—Free working, Red Sandstone.

In this Experiment, as in No. 11, the produce of head corn in the manured Plots, with the exception of Plot S, was less in amount than that of those without manure; a deficiency which may be traced to the same cause, all the farms in the Ross district having seriously suffered by the July rains.

WHEAT EXPERIMENTS, 1888.

[illegible] UPON LEY.—MR. C. J. NAYLOR'S EXPERIMENTS, MONTGOMERYSHIRE, NEAR KERRY.

RESULTS, CALCULATED PER ACRE.

Plots.	How Manured.	Quantity per Acre.	Cost of Manure per Acre.	Produce in Grain per Acre.		Natural Weight of Bushel.	Produce in Straw per Acre.	Corn. Increase or Decrease as compared with Average of Plots O and T. Increase.	Corn. Increase or Decrease as compared with Average of Plots O and T. Decrease.	Straw. Increase or Decrease as compared with Average of Plots O and T. Increase.	Straw. Increase or Decrease as compared with Average of Plots O and T. Decrease.
		cwts.	£ s. d.		bus. lbs.	lbs.	cwts. qrs. lbs.	bus. lbs.	bus. lbs.	cwts. qrs. lbs.	cwts. qrs. lbs.
O	No Manure	..	..	Head Corn Tail Corn	18 44 12 14	60 ..	31 2 0	.. ..	.. ..	..	..
P	Mineral Superphos. .. Nitrate of Soda	3 1½	1 1 0	Head Corn Tail Corn	19 33 13 6	59 ..	39 0 0	2 16 0 6	.. ..	12 0 0	..
Q	Mineral Superphos. .. Sulphate of Ammonia	3 1	1 1 0	Head Corn Tail Corn	21 0½ 13 44	59½ ..	35 0 0	3 42 0 44	.. ..	8 0 0	..
R	Sulphate of Ammonia	1	0 13 6	Head Corn Tail Corn	11 0½ 16 33	58½ ..	32 2 0	.. 3 33	6 17 ..	5 2 0	..
S	Nitrate of Soda	1½	0 13 6	Head Corn Tail Corn	16 0 15 26	59 ..	36 2 0	.. 2 26	1 17 ..	9 2 0	..
T	No Manure	..	..	Head Corn Tail Corn	15 51½ 13 36	59½ ..	22 2 0	.. ..	.. ..	..	..

Average of Plots O and T:—Head Corn, 17 bus. 17 lbs.; Tail Corn, 13 bus.; Straw, 27 cwts.

ABSTRACT OF PARTICULARS WITH REFERENCE TO EXPERIMENT No. 13,

Contained in Returns to Enquiries of Experimental Committee.

PREPARED BY THE CHAIRMAN.

Seed Wheat.—Old Redstraw and Squarehead, mixed, 3 bushels, sown October 7th, 1887.

Application of Manures.—Mineral Superphosphate, December 16th, 1887; Sulphate Ammonia and Nitrate Soda, April 16th, 1888; left on the surface.

First Rains after Application of Manures.—April 17th.

Previous Cultivation.—1883, Turnips (dunged). 1884, Barley, seeded with 6 lbs. Red Clover, 4 lbs. White Clover, 2 lbs. Alsike, 1 lb. Trefoil, 3 lbs. Italian Rye Grass. 1885, Seeds, left down till 1887, when all the Clovers had died out.

Soil.—Light Loam.

Mr. Naylor says that the Plots O, P, and Q are on the most sheltered side of the field, and protected by high fences on the north, east, and west sides. They are also nearer the farm buildings, where dairy cows have been kept, and consequently have received a larger quantity of the droppings. Plots R and S are on the most elevated and exposed part of the field, which is about 800 feet above the sea-level.

WHEAT EXPERIMENTS, 1888.

UPON LEY.—Mr. TILL'S EXPERIMENTS, Gloucestershire, Thornbury.

Results, Calculated per Acre.

Plots.	How Manured.	Quantity per Acre.	Cost of Manure per Acre.	Produce in Grain per Acre.			Natural Weight of Bushel.	Produce in Straw per Acre.			Corn. Increase or Decrease as compared with Average of Plots O and T. Increase.		Corn. Decrease.		Straw. Increase or Decrease as compared with Average of Plots O and T. Increase.			Straw. Decrease.		
		cwts.	£ s. d.		bus.	lbs.	lbs.	cwts.	qrs.	lbs.	bus.	lbs.	bus.	lbs.	cwts.	qrs.	lbs.	cwts.	qrs.	lbs.
O	No Manure	..	..	Head Corn	38	35	60	30	3	4	..		..		..			..		
				Tail Corn	3	30	..				..		..							
P	Mineral Superphos. ..	3	1 1 0	Head Corn	43	7	60	39	3	14	4	49	..		11	3	10	..		
	Nitrate of Soda	1¼		Tail Corn	6	39	..				3	46	..							
Q	Mineral Superphos. ..	3	1 1 0	Head Corn	46	15	60	38	2	17	7	57	..		10	2	13	..		
	Sulphate of Ammonia	1		Tail Corn	4	13	..				1	20	..							
R	Sulphate of Ammonia	1	0 13 6	Head Corn	40	29	60	32	0	12	2	11	..		4	0	8	..		
				Tail Corn	3	6	..				0	13	..							
S	Nitrate of Soda	1¼	0 13 6	Head Corn	38	0	59	31	2	13	..		0	18	3	2	9	..		
				Tail Corn	2	16	..				..		0	27						
T	No Manure	..	..	Head Corn	38	1	59	25	0	12	..		..		..			..		
				Tail Corn	2	7	..				..		..							

Average of Plots O and T:—Head Corn, 38 bus. 18 lbs.; Tail Corn, 2 bus. 43 lbs.; Straw, 28 cwts. 0 qr. 4 lbs.

ABSTRACT OF PARTICULARS WITH REFERENCE TO EXPERIMENT No. 14,

Contained in Returns to Enquiries of Experimental Committee.

PREPARED BY THE CHAIRMAN.

Seed Wheat.—Lincoln Red, 8½ pecks, sown October 18th.

Application of Manures.—Mineral Superphosphate, first week in February; left on the surface; Sulphate Ammonia and Nitrate Soda, third week in March; harrowed in and rolled.

First Rains after Application of Manures.—March 24th.

Previous Cultivation.—1882, Clover. 1883, Wheat. 1884, Swedes, fed off with sheep. 1885, Potatoes, Mangold and Oats. 1886, Scotch Wheat, seeded with 6 lbs. Red Clover, 2 lbs. White Clover, 4 lbs. Alsike, ½ bushel Italian Rye Grass (dunged in December with 15 loads to the acre). 1887, Clover, mown for hay; the Red and part of the other Clovers died out after the first mowing.

Soil.—Light Loam on Gravel.

The storms in July do not seem to have affected this Experiment; as Mr. Till remarks that though harvest was four weeks later, the Wheat stood up well to the last.

WHEAT EXPERIMENTS, 1888.

[illegible]LEY.—Mr. EDEN JONES' EXPERIMENTS, Gloucestershire, near Bristol.

Results, Calculated per Acre.

Plots.	How Manured.	Quantity per Acre.	Cost of Manure per Acre.	Produce in Grain per Acre.			Natural Weight of Bushel.	Produce in Straw per Acre.	Corn. Increase or Decrease as compared with Average of Plots O and T. Increase.	Corn. Decrease.	Straw. Increase or Decrease as compared with Average of Plots O and T. Increase.	Straw. Decrease.
		cwts.	£ s. d.		bus.	lbs.	lbs.	cwts. qrs. lbs.	bus. lbs.	bus. lbs.	cwts. qrs. lbs.	cwts. qrs. lbs.
O	No Manure	..	..	Head Corn	29	12	60	17 2 0	..	..	..	..
				Tail Corn	1	46	..		..	..		
P	Mineral Superphos. ..	3	1 1 0	Head Corn	27	13	60	16 2 0	..	3 55	..	2 1 14
	Nitrate of Soda	1¼		Tail Corn	1	44	..		..	0 5		
Q	Mineral Superphos. ..	3	1 1 0	Head Corn	26	12	60	16 2 0	..	4 56	..	2 1 14
	Sulphate of Ammonia	1		Tail Corn	1	40	..		..	0 9		
R	Sulphate of Ammonia	1	0 13 6	Head Corn	32	36	60	21 2 0	1 28	..	2 2 14	..
				Tail Corn	2	1	..		0 2	..		
S	Nitrate of Soda	1¼	0 13 6	Head Corn	34	32	61	21 3 0	3 24	..	2 3 14	..
				Tail Corn	2	0	..		0 1	..		
T	No Manure	..	..	Head Corn	33	4	60	20 1 0	..	..	..	..
				Tail Corn	2	2	..		..	..		

Average of Plots O and T:—Head Corn, 31 bus. 8 lbs.; Tail Corn, 1 bus. 49 lbs.; Straw, 18 cwts. 3 qrs. 14 lbs.

ABSTRACT OF PARTICULARS WITH REFERENCE TO EXPERIMENT No. 15,

Contained in Returns to Enquiries of Experimental Committee.

PREPARED BY THE CHAIRMAN.

Seed Wheat.—White, 3 bushels, sown November 12th, 1887.

Application of Manures.—Mineral Superphosphate, November 14th, harrowed in. Sulphate Ammonia, Nitrate Soda, May 5th.

Previous Cultivation.—1884, Wheat (60 bushels soot per acre in April, 1884). 1885, Swedes (10 loads farmyard-manure and 4 cwt. dissolved bones per acre). 1886, Barley, seeded with 10 lbs. Broad Clover, 6 lbs. Trefoil and 1 bushel Italian Rye Grass. 1887, Seeds, mown once, then fed.

Soil.—Deep sandy loam on Red Sandstone.

The Wheat in Mr. Eden Jones' field (like most others on Ley) lost plant in the winter, making the crop irregular; the plant on Plot P being thin, and on Q very thin, while on R and S there was a fair plant for the season. This accounts for the variation in the produce.

WHEAT EXPERIMENTS, 1888.

JPUN LEY.—Major SPARKS' EXPERIMENTS, Dorsetshire, near Weymouth.

Results, Calculated per Acre.

Plots.	How Manured.	Quantity per Acre.	Cost of Manure per Acre.	Produce in Grain per Acre.			Natural Weight of Bushel.	Produce in Straw per Acre.			Corn. Increase or Decrease as compared with Average of Plots O and T. Increase.		Corn. Decrease.		Straw. Increase or Decrease as compared with Average of Plots O and T. Increase.			Straw. Decrease.		
		cwts.	£ s. d.		bus.	lbs.	lbs.	cwts.	qrs.	lbs.	bus.	lbs.	bus.	lbs.	cwts.	qrs.	lbs.	cwts.	qrs.	lbs.
O	No Manure	..	..	Head Corn	20	24	58	25	2	15	..		..		..			..		
				Tail Corn	1	34	..				..		..							
P	Mineral Superphos. ..	3	1 1 0	Head Corn	25	22	59	29	2	22	4	26	..		3	0	18	..		
	Nitrate of Soda	1¼		Tail Corn	1	43	..				0	13	..							
Q	Mineral Superphos. ..	3	1 1 0	Head Corn	30	38	59	26	1	9	9	42	..		..			0	0	23
	Sulphate of Ammonia	1		Tail Corn	2	17	..				0	37	..							
R	Sulphate of Ammonia	1	0 13 6	Head Corn	30	44	58½	32	2	14	9	47	..		6	0	10	..		
				Tail Corn	1	46	..				0	16	..							
S	Nitrate of Soda	1¼	0 13 6	Head Corn	25	19	58½	32	0	17	4	22	..		5	2	13	..		
				Tail Corn	1	27	..				..		0	3						
T	No Manure	..	..	Head Corn	21	28	57½	27	1	21	..		..		..			..		
				Tail Corn	1	27	..				..		..							

Average of Plots O and T:—Head Corn, 20 bus. 55 lbs.; Tail Corn, 1 bus. 30 lbs.; Straw, 26 cwts. 2 qrs. 4 lbs.

ABSTRACT OF PARTICULARS WITH REFERENCE TO EXPERIMENT No. 16,

Contained in Returns to Enquiries of Experimental Committee.

PREPARED BY THE CHAIRMAN.

Seed Wheat.—White, 3 bushels, sown October 29th, 1887.

Application of Manures.—Mineral Superphosphate, December 28th, 1887. Sulphate Ammonia and Nitrate Soda, March 5th.

First Rains after Application of Manures.—January 1st and March 7th.

Previous Cultivation.—1881, Clover. 1882, Fallow. 1883, Spring Wheat. 1884, Mangold (dunged 20 loads). 1885, Spring Wheat, seeded with 6 lbs. Red Clover, 7 lbs. Broad Clover, 1 lb. Alsike, 1 bushel Devon Eaver. 1886, Clover, mown. 1887, Clover, fed with sheep, patches of Clover died out.

Soil.—Limestone, clay subsoil.

Mr. Brain says, "that a hay-rick standing on Plot R, and the sheep feeding some of it near the rick, and being penned a few nights there, was the cause of that Plot yielding more straw and a trifle more corn than the others."

WHEAT EXPERIMENTS, 1888.

[illegible]N CROP UPON LEY.—Mr. BESENT'S EXPERIMENTS, Dorsetshire, near Blandford.

Results, Calculated per Acre.

Plots.	How Manured.	Quantity per Acre.	Cost of Manure per Acre.	Produce in Grain per Acre.		Natural Weight of Bushel.	Produce in Straw per Acre.	Corn. Increase or Decrease as compared with Average of Plots O and T. Increase.	Corn. Decrease.	Straw. Increase or Decrease as compared with Average of Plots O and T. Increase.	Straw. Decrease.
		cwts.	£ s. d.		bus. lbs.	lbs.	cwts. qrs. lbs.	bus. lbs.	bus. lbs.	cwts. qrs. lbs.	cwts. qrs. lbs.
O	No Manure	..	..	Head Corn	24 19	60	35 3 4	..	..	..	..
				Tail Corn	9 45	..		..	..		
P	Mineral Superphos. ..	3	1 1 0	Head Corn	26 13	60	37 2 0	2 45	..	2 1 9	..
	Nitrate of Soda	1¼		Tail Corn	13 18	..		2 45	..		
Q	Mineral Superphos. ..	3	1 1 0	Head Corn	26 5	60	38 0 4	2 37	..	2 3 13	..
	Sulphate of Ammonia	1		Tail Corn	14 29	..		4 6	..		
R	Sulphate of Ammonia	1	0 13 6	Head Corn	25 14	60	36 3 20	1 46	..	1 3 1	..
				Tail Corn	13 36	..		3 13	..		
S	Nitrate of Soda	1¼	0 13 6	Head Corn	24 7	60	37 0 19	0 39	..	2 0 0	..
				Tail Corn	15 49	..		5 26	..		
T	No Manure	..	..	Head Corn	22 38	60	34 2 6	..	..	..	..
				Tail Corn	11 1	..		..	..		

Average of Plots O and T:—Head Corn, 23 bus. 28 lbs.; Tail Corn, 10 bus. 23 lbs.; Straw, 35 cwts. 0 qr. 19 lbs.

ABSTRACT OF PARTICULARS WITH REFERENCE TO EXPERIMENT No. 17,

Contained in Returns to Enquiries of Experimental Committee.

PREPARED BY THE CHAIRMAN.

Seed Wheat.—Red, 2¼ bushels, sown November 22nd, 1887.

Application of Manures.—Mineral Superphosphate, November 24th, harrowed in. Sulphate Ammonia and Nitrate Soda, May 11th, harrowed in and rolled.

First Rains after Application of Manures.—November 25th and May 12th.

Previous Cultivation.—1884, Roots. 1885, Barley, seeded with 8 lbs. Red Clover, 2 lbs. White Clover, 2 lbs. Alsike, ½ bushel Rye Grasses. 1886, Seeds, mown for hay, aftermath fed by lambs with cake. 1887, Seeds, fed off early by ewes and lambs with corn and cake, then raftered and dunged (15 loads) and sown to Rape, Turnips and Kale mixed (2 bushels bone dust and 2 cwt. dissolved bones) on which lambs eating plenty of cake were folded at night.

Soil.—Medium, with chalk on chalk subsoil.

Mr. Besent remarks on the unfavourable character of the season, the late frosts, and the want of sun.

WHEAT EXPERIMENTS, 1888.

[illegible] FALLOW.—Mr. STORY-MASKELYNE'S EXPERIMENTS, Wiltshire, near Swindon.

Results, Calculated per Acre.

Plots.	How Manured.	Quantity per Acre.	Cost of Manure per Acre.	Produce in Grain per Acre.		Natural Weight of Bushel.	Produce in Straw per Acre.	Corn. Increase or Decrease as compared with Average of Plots O and T.		Straw. Increase or Decrease as compared with Average of Plots O and T.	
								Increase.	Decrease.	Increase.	Decrease.
		cwts.	£ s. d.		bus. lbs.	lbs.	cwts. qrs. lbs.	bus. lbs.	bus. lbs.	cwts. qrs. lbs.	cwts. qrs. lbs.
O	No Manure	..	..	Head Corn Tail Corn							
P	Mineral Superphos. .. Nitrate of Soda	3 1¼	1 1 0	Head Corn Tail Corn							
Q	Mineral Superphos. .. Sulphate of Ammonia	3 1	1 1 0	Head Corn Tail Corn							
R	Sulphate of Ammonia	1	0 13 6	Head Corn Tail Corn							
S	Nitrate of Soda	1¼	0 13 6	Head Corn Tail Corn							
T	No Manure	..	..	Head Corn Tail Corn							

ABSTRACT OF PARTICULARS WITH REFERENCE TO EXPERIMENT No. 18,

Contained in Returns to Enquiries of Experimental Committee.

PREPARED BY THE CHAIRMAN.

The Crop in this case was so injured by weather that it was found impossible to complete the Experiment.

WHEAT EXPERIMENTS, 1888.

[illegible]—Mr. H. Richards' Experiments, Wiltshire, Charlton, near Shaftesbury.

Results, Calculated per Acre.

Plots.	How Manured.	Quantity per Acre.	Cost of Manure per Acre.	Produce in Grain per Acre.			Natural Weight of Bushel.	Produce in Straw per Acre.	Corn. Increase or Decrease as compared with Average of Plots O and T. Increase.	Corn. Decrease.	Straw. Increase or Decrease as compared with Average of Plots O and T. Increase.	Straw. Decrease.
		cwts.	£ s. d.		bus.	lbs.	lbs.	cwts. qrs. lbs.	bus. lbs.	bus. lbs.	cwts. qrs. lbs.	cwts. qrs. lbs.
O	No Manure..	..	..	Head Corn	23	31	62	25 2 0	..	..	..	..
				Tail Corn	1	43	..		..	..		
P	Mineral Superphos. ..	3	1 1 0	Head Corn	30	0	62	31 0 0	8 39	..	8 3 0	..
	Nitrate of Soda	1¼		Tail Corn	1	12	..		..	0 15		
Q	Mineral Superphos. ..	3	1 1 0	Head Corn	27	46	62	26 0 0	6 23	..	3 3 0	..
	Sulphate of Ammonia	1		Tail Corn	2	24	..		0 47	..		
R	Sulphate of Ammonia	1	0 13 6	Head Corn	27	0	62	26 2 0	5 39	..	4 1 0	..
				Tail Corn	1	27	..		..	..		
S	Nitrate of Soda	1¼	0 13 6	Head Corn	27	0	62	27 2 0	5 39	..	5 1 0	..
				Tail Corn	1	43	..		0 16	..		
T	No Manure..	..	..	Head Corn	19	15	62	19 0 0	..	..	..	..
				Tail Corn	1	12	..		..	..		

Average of Plots O and T:—Head Corn, 21 bus. 23 lbs.; Tail Corn, 1 bus. 27 lbs.; Straw, 22 cwts. 1 qr.

ABSTRACT OF PARTICULARS WITH REFERENCE TO EXPERIMENT No. 19,

Contained in Returns to Enquiries of Experimental Committee.

PREPARED BY THE CHAIRMAN.

Seed Wheat.—Golden Drop, 2½ bushels, sown October 5th, 1887.

Application of Manures.—Mineral Superphosphate, December 21st. Sulphate Ammonia and Nitrate Soda, April 20th.

First Rains after Application of Manures.—Within a few days of application.

Previous Cultivation.—1884, Swedes. 1885, Turnips. 1886, Barley. 1887, Beans.

Soil.—Medium on chalk.

Mr. Richards remarks on the absence of sun and the ungenial character of the season as being most unfavourable for the Wheat crop; that the manured Plots were somewhat laid in places, and Plot S especially so.

WHEAT EXPERIMENTS, 1888.

Messrs. C. and T. COLES' EXPERIMENTS, Wiltshire, Edge of Salisbury Plain.

Results, Calculated per Acre.

Plots.	How Manured.	Quantity per Acre.	Cost of Manure per Acre.	Produce in Grain per Acre.			Natural Weight of Bushel.	Produce in Straw per Acre.			Corn. Increase or Decrease as compared with Average of Plots O and T. Increase.		Corn. Decrease.		Straw. Increase or Decrease as compared with Average of Plots O and T. Increase.			Straw. Decrease.		
		cwts.	£ s. d.		bus.	lbs.	lbs.	cwts.	qrs.	lbs.	bus.	lbs.	bus.	lbs.	cwts.	qrs.	lbs.	cwts.	qrs.	lbs.
O	No Manure	..	..	Head Corn Tail Corn	26 0	28 42	62 ..	25	3	10	.. ..			.. ..		..			..	
P	Mineral Superphos. .. Nitrate of Soda	3 1½	1 1 0	Head Corn Tail Corn	31 1	0 1	61½ ..	29	1	2	2 0	32 7		.. ..	3	1	11		..	
Q	Mineral Superphos. .. Sulphate of Ammonia	3 1	1 1 0	Head Corn Tail Corn	29 1	35 13	62 ..	26	0	0	1 0	6 19		.. ..	0	0	9		..	
R	Sulphate of Ammonia	1	0 13 6	Head Corn Tail Corn	32 0	0 38	59 ..	30	2	14	3 ..	30	 0	.. 6	4	2	23		..	
S	Nitrate of Soda	1½	0 13 6	Head Corn Tail Corn	36 1	5 32	60½ ..	33	2	0	7 0	36 38		.. ..	7	2	9		..	
T	No Manure	..	..	Head Corn Tail Corn	30 0	31 47	60 ..	26	0	0	.. ..			.. ..		..			..	

Average of Plots O and T:—Head Corn, 28 bus. 29 lbs.; Tail Corn, 44 lbs.; Straw, 25 cwts. 3 qrs. 19 lbs.

ABSTRACT OF PARTICULARS WITH REFERENCE TO EXPERIMENT No. 20,

Contained in Returns to Enquiries of Experimental Committee.

Prepared by the Chairman.

Seed Wheat.—Mixed Red and White, 2½ bushels, sown October 15th, 1887.

Application of Manures.—Mineral Superphosphate, December 3rd, 1887. Sulphate Ammonia and Nitrate Soda, April 16th, 1888, left on the surface.

First Rains after Application of Manures.—April 16th.

Previous Cultivation.—1883, Rape, folded and dunged. 1884, Wheat. 1885, Barley (no manure) sown with 12 lbs. Red Clover, 1 lb. White Clover, 1 lb. Alsike, 3 lbs. Trefoil, 2 lbs. Devon Eaver. 1886, Clover, mown for hay, aftermath fed with sheep. 1887, Clover Ley, strawed thickly in winter and folded with sheep in May, then summer fallowed.

Soil.—Gravel on chalk.

Messrs. Coles state that whilst the Wheat was being carried there were two heavy storms, which affected the produce of R, S, and T, decreasing the weight per bushel, but increasing the quantity of grain per acre, and the weight of straw.

WHEAT EXPERIMENTS, 1888.

AFTER ROOTS FAILED UPON LEY.—Mr. MARK WALLIS' EXPERIMENTS, Wilts, Salisbury Plain South.

Results, Calculated per Acre.

Plots.	How Manured.	Quantity per Acre.	Cost of Manure per Acre.	Produce in Grain per Acre.			Natural Weight of Bushel.	Produce in Straw per Acre.	Corn. Increase or Decrease as compared with Average of Plots O and T. Increase.	Corn. Decrease.	Straw. Increase or Decrease as compared with Average of Plots O and T. Increase.	Straw. Decrease.
		cwts.	£ s. d.		bus.	lbs.	lbs.	cwts. qrs. lbs.	bus. lbs.	bus. lbs.	cwts. qrs. lbs.	cwts. qrs. lbs.
O	No Manure	..	..	Head Corn	24	4	59	30 0 4	..	..	..	..
				Tail Corn	1	10	..		..	..		
P	Mineral Superphos. ..	3	1 1 0	Head Corn	22	0	58½	29 3 9	..	2 2	..	0 2 22
	Nitrate of Soda	1¼		Tail Corn	1	6	..		..	..		
Q	Mineral Superphos. ..	3	1 1 0	Head Corn	23	5	60	30 3 6	..	0 56	0 1 3	..
	Sulphate of Ammonia	1		Tail Corn	1	2	..		..	0 4		
R	Sulphate of Ammonia	1	0 13 6	Head Corn	19	28	59½	27 0 9	..	4 33	..	3 1 22
				Tail Corn	1	6	..		..	..		
S	Nitrate of Soda	1¼	0 13 6	Head Corn	19	16	58	27 1 17	..	4 45	..	3 0 14
				Tail Corn	1	11	..		0 5	..		
T	No Manure	..	..	Head Corn	24	0	58½	31 0 3	..	..	..	..
				Tail Corn	1	2	..		..	..		

Average Plots O and T:—Head Corn, 24 bus. 2 lbs.; Tail Corn, 1 bus. 6 lbs.; Straw, 30 cwts. 2 qrs. 3 lbs.

ABSTRACT OF PARTICULARS WITH REFERENCE TO EXPERIMENT No. 21,

Contained in Returns to Enquiries of Experimental Committee.

PREPARED BY THE CHAIRMAN.

Seed Wheat.—Golden Drop, 2¼ bushels, sown November 12th, 1887.

Application of Manures.—Mineral Superphosphate, November 23rd, harrowed in; Sulphate Ammonia and Nitrate Soda, April 12th; rolled in.

First Rains after Application of Manures.—April 12th.

Previous Cultivation.—1885, Barley. 1886, Seeds, Italian Rye Grass and Clover, mown for hay. 1887, Roots failed (upon Ley raftered and dunged), drilled with 1 cwt. ashes, and 2 cwt. special Turnip manure per acre.

Soil.—Light and flinty on chalk.

Mr. Wallis writes that, owing to the Wheat being a thin plant, the summer weeds (chiefly Wild Carrot and Charlock) got ahead on the manured Plots, while the unmanured Plots were fairly clean. This Experiment is very instructive, as showing how readily weeds avail themselves of these manures, robbing the corn of that which is intended for it. See Sir John Lawes' remarks on this subject, p. 99 of this 'Journal.'

WHEAT EXPERIMENTS, 1888.

[illegible] MANGOLDS.—MR. TOM GRAY'S EXPERIMENTS, WILTS, SALISBURY PLAIN NORTH.

RESULTS, CALCULATED PER ACRE.

Plot.	How Manured.	Quantity per Acre.	Cost of Manure per Acre.	Produce in Grain per Acre.			Natural Weight of Bushel.	Produce in Straw per Acre.			Corn. Increase or Decrease as compared with Average of Plots O and T. Increase.		Corn. Decrease.		Straw. Increase or Decrease as compared with Average of Plots O and T. Increase.			Straw. Decrease.		
		cwts.	£ s. d.		bus.	lbs.	lbs.	cwts.	qrs.	lbs.	bus.	lbs.	bus.	lbs.	cwts.	qrs.	lbs.	cwts.	qrs.	lbs.
O	No Manure	..	..	Head Corn	19	50	58½	28	2	27	..		..		..			..		
				Tail Corn	8	34	..				..		..							
P	Mineral Superphos. ..	3	1 1 0	Head Corn	17	29	58	34	3	5	..		1	54	5	2	27	..		
	Nitrate of Soda	1½		Tail Corn	11	29	..				2	49	..							
Q	Mineral Superphos. ..	3	1 1 0	Head Corn	14	1	58	30	0	2	..		5	24	0	3	24	..		
	Sulphate of Ammonia	1		Tail Corn	9	47	..				1	17	..							
R	Sulphate of Ammonia	1	0 13 6	Head Corn	16	14	58½	32	1	14	..		3	11	3	1	8	..		
				Tail Corn	9	17	..				0	37	..							
S	Nitrate of Soda	1½	0 13 6	Head Corn	18	11	58	35	2	20	..		1	14	6	2	14	..		
				Tail Corn	11	48	..				3	18	..							
T	No Manure	..	..	Head Corn	19	1	58¼	29	1	14	..		..		..			..		
				Tail Corn	8	26	..				..		..							

Average Plots O and T:—Head Corn, 19 bus. 25 lbs.; Tail Corn, 8 bus. 30 lbs.; Straw, 29 cwts. 0 qr. 6 lbs.

ABSTRACT OF PARTICULARS WITH REFERENCE TO EXPERIMENT No. 22,

Contained in Returns to Enquiries of Experimental Committee.

PREPARED BY THE CHAIRMAN.

Seed Wheat.—Squarehead, $2\frac{3}{4}$ bushels, sown November 30th, 1887.

Application of Manures.—Mineral Superphosphate, November 30th, 1887. Sulphate Ammonia and Nitrate Soda, 30th April, 1888.

Previous Cultivation.—1883, "Old field." 1884, Wheat. 1885, Barley. 1886, Swedes. 1887, Mangold (dunged), sheep folded over Mangold leaves.

Soil.—Light Chalk.

It will be observed in this case that while there was a considerable increase of straw on Plots receiving manure, there was a decrease of head corn as compared with the unmanured Plots; the increase in grain being only in tail corn. Mr. Gray attributes this to the fact of the manured Plots being more blighted than the others.

WHEAT EXPERIMENTS, 1888.

N[illegible] —[illegible]TER TURNIPS FOLDED.—MR. W. H. IREMONGER'S EXPERIMENTS, HAMPSHIRE, NEAR ANDOVER.

RESULTS, CALCULATED PER ACRE.

Plots.	How Manured.	Quantity per Acre.	Cost of Manure per Acre.	Produce in Grain per Acre.			Natural Weight of Bushel.	Produce in Straw per Acre.			Corn. Increase or Decrease as compared with Average of Plots O and T. Increase.		Corn. Decrease.		Straw. Increase or Decrease as compared with Average of Plots O and T. Increase.			Straw. Decrease.		
		cwts.	£ s. d.		bus.	lbs.	lbs.	cwts.	qrs.	lbs.	bus.	lbs.	bus.	lbs.	cwts.	qrs.	lbs.	cwts.	qrs.	lbs.
O	No Manure..	..	..	Head Corn	33	16	58¼	33	2	20	..		..			..			..	
				Tail Corn	1	32	..				..		..							
P	Mineral Superphos. ..	3	1 1 0	Head Corn	34	9	58¼	33	1	11	2	12	..		0	1	24		..	
	Nitrate of Soda	1¼		Tail Corn	2	32	..				0	15	..							
Q	Mineral Superphos. ..	3	1 1 0	Head Corn	36	40	58½	37	0	4	4	43	..		4	0	17		..	
	Sulphate of Ammonia	1		Tail Corn	2	40	..				0	23	..							
R	Sulphate of Ammonia	1	0 13 6	Head Corn	34	20	58	33	2	15	2	23	..		0	3	0		..	
				Tail Corn	2	41	..				0	24	..							
S	Nitrate of Soda	1¼	0 13 6	Head Corn	34	29	58¼	36	1	2	2	32	..		3	1	15		..	
				Tail Corn	1	32	..				..		0	35						
T	No Manure..	..	..	Head Corn	30	36	58¼	32	0	10	..		..			..			..	
				Tail Corn	3	2	..				..		..							

Average of Plots O and T:—Head Corn, 31 bus. 55 lbs.; Tail Corn, 2 bus. 17 lbs.; Straw, 32 cwts. 3 qrs. 15 lbs.

ABSTRACT OF PARTICULARS WITH REFERENCE TO EXPERIMENT No. 23,

Contained in Returns to Enquiries of Experimental Committee.

PREPARED BY THE CHAIRMAN.

Seed Wheat.—Red and White, mixed, 2½ bushels, sown November 24th, 1887.

Application of Manures.—Mineral Superphosphate, February 4th. Sulphate Ammonia and Nitrate Soda, April 14th, all left on the surface.

First Rains after Application of Manures.—February 11th and April 16th.

Previous Cultivation.—1884, Barley. 1885, Italian Rye Grass. 1886, Italian Rye Grass, folded off before being ploughed up. 1887, Turnips, a bad crop, folded off by sheep, after which the land was dunged with 16 loads per acre from lambing pen.

Soil.—Light, gravel and chalk.

Mr. Studdy says that the Wheat on all the Plots was laid; Plot P being laid the most, and Plot T the least.

WHEAT EXPERIMENTS, 1888.

[illegible] ARD FAILED UPON LEY.—Mr. EAST'S EXPERIMENTS, Hampshire, near Stockbridge.

Results, Calculated per Acre.

Plots.	How Manured.	Quantity per Acre.	Cost of Manure per Acre.	Produce in Grain per Acre.			Natural Weight of Bushel.	Produce in Straw per Acre.	Corn. Increase or Decrease as compared with Average of Plots O and T.		Straw. Increase or Decrease as compared with Average of Plots O and T.	
									Increase.	Decrease.	Increase.	Decrease.
		cwts.	£ s. d.		bus.	lbs.	lbs.	cwts. qrs. lbs.	bus. lbs.	bus. lbs.	cwts. qrs. lbs.	cwts. qrs. lbs.
O	No Manure	..	..	Head Corn	20	24	60½	25 0 12	..	..	..	..
				Tail Corn	5	40	..		..	..		
P	Mineral Superphos. ..	3	1 1 0	Head Corn	20	31	58¼	31 3 15	3 54	..	7 2 6	..
	Nitrate of Soda	1¼		Tail Corn	7	34	..		2 36	..		
Q	Mineral Superphos. ..	3	1 1 0	Head Corn	18	0	58	27 3 25	1 23	..	3 2 16	..
	Sulphate of Ammonia	1		Tail Corn	6	1	..		1 3	..		
R	Sulphate of Ammonia	1	0 13 6	Head Corn	14	37	57	27 3 4	..	1 56	3 1 23	..
				Tail Corn	4	19	..		..	0 29		
S	Nitrate of Soda	1¼	0 13 6	Head Corn	14	3	56	26 1 10	..	2 32	2 0 1	..
				Tail Corn	4	0	..		..	0 48		
T	No Manure	..	..	Head Corn	12	46	56	23 2 6	..	..	..	..
				Tail Corn	4	6	..		..	..		

Average of Plots O and T:—Head Corn, 16 bus. 35 lbs.; Tail Corn, 4 bus. 48 lbs.; Straw, 24 cwts. 1 qr. 9 lbs.

ABSTRACT OF PARTICULARS WITH REFERENCE TO EXPERIMENT No. 24,

Contained in Returns to Enquiries of Experimental Committee.

PREPARED BY THE CHAIRMAN.

Seed Wheat.—White, $2\frac{1}{2}$ bushels, November 26th and December 1st.

Application of Manures.—Mineral Superphosphate, January 24th. Sulphate Ammonia and Nitrate Soda, May 13th, all left on the surface.

First Rains after Application of Manures.—February 10th and May 15th.

Previous Cultivation.—1881, Swedes (3 cwt. Superphosphate), fed off by sheep. 1882, Barley. 1883, Clover. 1884, Rough Chaff Wheat (dunged). 1885, Swedes (3 cwt. Superphosphate with ashes), fed off by sheep. 1886, Oats. 1887, English Trefoil (18 lbs. of seed per acre) cut for hay; a good crop, followed by Mustard failed; folded with sheep on chaff and cake.

Soil.—Chalk, fairly heavy for chalk subsoil.

Mr. R. Hewett states that a terrific storm and waterspout burst over the field on the 6th of July; that this storm and the heavy rains later in the month entirely spoilt the Experiments, and that the Wheat on Plots R, S, and T was beaten down on the ground as flat as if it had been rolled.

WHEAT EXPERIMENTS, 1888.

AFTER PEAS.—Mr. BENYON'S EXPERIMENTS, Berkshire, near Reading.

Results, Calculated per Acre.

Plots.	How Manured.	Quantity per Acre.	Cost of Manure per Acre.	Produce in Grain per Acre.		Natural Weight of Bushel.	Produce in Straw per Acre.	Corn. Increase or Decrease as compared with Average of Plots O and T. Increase.	Corn. Increase or Decrease as compared with Average of Plots O and T. Decrease.	Straw. Increase or Decrease as compared with Average of Plots O and T. Increase.	Straw. Increase or Decrease as compared with Average of Plots O and T. Decrease.
		cwts.	£ s. d.		bus. lbs.	lbs.	cwts. qrs. lbs.	bus. lbs.	bus. lbs.	cwts. qrs. lbs.	cwts. qrs. lbs.
O	No Manure	..	..	Head Corn							
				Tail Corn							
P	Mineral Superphos. ..	3	1 1 0	Head Corn							
	Nitrate of Soda	1¼		Tail Corn							
Q	Mineral Superphos. ..	3	1 1 0	Head Corn							
	Sulphate of Ammonia	1		Tail Corn							
R	Sulphate of Ammonia	1	0 13 6	Head Corn							
				Tail Corn							
S	Nitrate of Soda	1¼	0 13 6	Head Corn							
				Tail Corn							
T	No Manure	..	..	Head Corn							
				Tail Corn							

ABSTRACT OF PARTICULARS WITH REFERENCE TO EXPERIMENT No. 25,

Contained in Returns to Enquiries of Experimental Committee.

PREPARED BY THE CHAIRMAN.

Mr. Todd writes that the heavy rain so laid and damaged the Wheat on the manured Plots as to render the Experiment valueless. He adds, that the Wheat on the unmanured Plots was much less injured.

WHEAT EXPERIMENTS, 1888.

...ARES FED OFF.—LORD WANTAGE'S EXPERIMENTS, BERKSHIRE, NEAR WANTAGE.

RESULTS, CALCULATED PER ACRE.

	How Manured.	Quantity per Acre.	Cost of Manure per Acre.	Produce in Grain per Acre.		Natural Weight of Bushel.	Produce in Straw per Acre.	Corn. Increase or Decrease as compared with Average of Plots O and T.		Straw. Increase or Decrease as compared with Average of Plots O and T.	
								Increase.	Decrease.	Increase.	Decrease.
		cwts.	£ s. d.		bus. lbs.	lbs.	cwts. qrs. lbs.	bus. lbs.	bus. lbs.	cwts. qrs. lbs.	cwts. qrs. lbs.
O	No Manure..	..	..	Head Corn Tail Corn							
P	Mineral Superphos. .. Nitrate of Soda	3 1¼	1 1 0	Head Corn Tail Corn							
Q	Mineral Superphos. .. Sulphate of Ammonia	3 1	1 1 0	Head Corn Tail Corn							
R	Sulphate of Ammonia	1	0 13 6	Head Corn Tail Corn							
S	Nitrate of Soda	1¼	0 13 6	Head Corn Tail Corn							
T	No Manure..	..	..	Head Corn Tail Corn							

ABSTRACT OF PARTICULARS WITH REFERENCE TO EXPERIMENT No. 26,

Contained in Returns to Enquiries of Experimental Committee.

PREPARED BY THE CHAIRMAN.

Mr. Eady writes that the Wheat was so injured by the wet season, that the Experiment could not be carried out. He adds that the manured Plots were the worst.

WHEAT EXPERIMENTS, 1888.

...EY.—MR. J. STEWART HODGSON'S EXPERIMENTS, SURREY, HASLEMERE.

RESULTS, CALCULATED PER ACRE.

Plots.	How Manured.	Quantity per Acre.	Cost of Manure per Acre.	Produce in Grain per Acre.		Natural Weight of Bushel.	Produce in Straw per Acre.	Corn. Increase or Decrease as compared with Average of Plots O and T. Increase.	Corn. Decrease.	Straw. Increase or Decrease as compared with Average of Plots O and T. Increase.	Straw. Decrease.
		cwts.	£ s. d.		bus. lbs.	lbs.	cwts. qrs. lbs.	bus. lbs.	bus. lbs.	cwts. qrs. lbs.	cwts. qrs. lbs.
O	No Manure..	..	..	Head Corn Tail Corn							
P	Mineral Superphos. .. Nitrate of Soda	3 1½	1 1 0	Head Corn Tail Corn							
Q	Mineral Superphos. .. Sulphate of Ammonia	3 1	1 1 0	Head Corn Tail Corn							
R	Sulphate of Ammonia	1	0 13 6	Head Corn Tail Corn							
S	Nitrate of Soda	1½	0 13 6	Head Corn Tail Corn							
T	No Manure..	..	..	Head Corn Tail Corn							

ABSTRACT OF PARTICULARS WITH REFERENCE TO EXPERIMENT No. 27,

Contained in Returns to Enquiries of Experimental Committee.

PREPARED BY THE CHAIRMAN.

Mr. Purkis reports that, owing to the heavy rains, these Experiments could not be carried out.

WHEAT EXPERIMENTS, 1888.

[illegible] PON LEY.—Mr. W. ASHCROFT'S EXPERIMENTS, Kent, near Beckenham.

Results, Calculated per Acre.

Plots.	How Manured.	Quantity per Acre.	Cost of Manure per Acre.	Produce in Grain per Acre.		Natural Weight of Bushel.	Produce in Straw per Acre.	Corn. Increase or Decrease as compared with Average of Plots O and T. Increase.	Corn. Increase or Decrease as compared with Average of Plots O and T. Decrease.	Straw. Increase or Decrease as compared with Average of Plots O and T. Increase.	Straw. Increase or Decrease as compared with Average of Plots O and T. Decrease.
		cwts.	£ s. d.		bus. lbs.	lbs.	cwts. qrs. lbs.	bus. lbs.	bus. lbs.	cwts. qrs. lbs.	cwts. qrs. lbs.
O	No Manure	..	..	Head Corn Tail Corn							
P	Mineral Superphos. .. Nitrate of Soda	3 1¼	1 1 0	Head Corn Tail Corn							
Q	Mineral Superphos. .. Sulphate of Ammonia	3 1	1 1 0	Head Corn Tail Corn							
R	Sulphate of Ammonia	1	0 13 6	Head Corn Tail Corn							
S	Nitrate of Soda	1¼	0 13 6	Head Corn Tail Corn							
T	No Manure	..	..	Head Corn Tail Corn							

OF PARTICULARS WITH REFERENCE TO EXPERIM

Contained in Returns to Enquiries of Experimental Committee.

PREPARED BY THE CHAIRMAN.

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es that, owing to the failure of the Wheat-plant, the land was
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XVI.—*The Wheat Experiments of* 1888. By Dr. J. AUGUSTUS VOELCKER, B.Sc., F.C.S., Consulting Chemist to the Society.

THE misfortunes attending an unfavourable season do not fall alone upon practical farmers, but also neutralise to a considerable extent the efforts of experimenters and scientific enquirers in agriculture. If the season of 1887 had to be recorded as unfavourable for the proper action of the manures employed in the experiments then, how much more decidedly could this be said as regards that of 1888. Indeed, it is hardly too much to say that through its exceptional character the value of the experiments has been almost entirely destroyed. It is my duty, however, to go through them in brief review, and to select and collect such features of interest as may point to useful lessons. In all there were twenty-four completed trials:—one of which (No. 3)—on wet peaty soil—I must exclude from consideration, by reason of the extremely meagre produce. Of the remaining twenty-three, fourteen were upon ley, three after roots, one after beans, one after fallow, and four after green crops. Where the results obtained have appeared to me of doubtful accuracy or inconsistent, I have taken the liberty of leaving them partly out of consideration. In some instances, *e.g.* Nos. 1, 4D, 15, and 24, it is pretty clear from the yields of the duplicate unmanured plots that one end of the experimental ground has been naturally better than the other. My general conclusions, though arrived at by a different method, are, I may at once say, in the main those come to by our Chairman in his report, to which I would add a re-statement of my opinion, as expressed in reference to the 1886 experiments, that "after a good clover crop the application of artificial manures is unnecessary and unprofitable."

Firstly.—I notice eight cases in which the use of mineral superphosphate as an addition to either nitrate of soda or sulphate of ammonia has been attended with benefit; viz. Nos. 1, 7, 13, 14, 21, and to a lesser degree Nos. 10, 17, and 19. Not only the corn, but also the straw has been increased in several instances (especially Nos. 1, 7, and 14). There is no evidence of loss attending the use of superphosphate, and accordingly I regard it as advisable to employ it.

Secondly.—As between the nitrate of soda and sulphate of ammonia. In consequence of the excessive wet it might be expected that the more ready solubility, and removal by drainage, of nitrate of soda, would in such a season tell somewhat against it, and though, on account of the relatively small differences of yield, this is not very clearly established, I believe I am correct in saying, that on the whole sulphate of ammonia

did rather the better. There are three cases which bear investigation (Nos. 8, 20 and 22) where nitrate of soda showed superiority, and six (Nos. 4, 5, 9, 10, 14, and 16) in which sulphate of ammonia had the advantage as regards corn. On the other hand, nitrate of soda produced generally more straw, (compare Nos. 2, 4D, 7, 8, 12, 13, 19, and 20), though in Nos. 4 and 10, the reverse was the case.

Thirdly.—Looking at the probable financial result, I make out only six instances in which one or more of the manures can be said to have been profitably used (Nos. 1, 5, 8, 14, 16, and 19), and in four of these there could have been only a small margin. Where wheat followed beans (No. 19), there having been no clover for the last four years, an increase was obtained with all the manures, and it is noticeable how small was the proportion of tail corn: and in one case (No. 16) of wheat upon ley there was also a gain, this gain being chiefly with sulphate of ammonia, and the soil being limestone. The remaining four were cases in which one special plot, or at most two, showed an increase, and that only a bare one, considered monetarily.

On the other hand, we have 17 experiments showing no paying result at all, and of these, no less than 10 were upon ley (Nos. 2, 4, 4D, 5, 9, 11, 12, 13, 15, and 20). I am accordingly, I think, warranted in reasserting my previous conclusion as to the employment of artificial manures after a good clover crop being unnecessary and unprofitable.

The seven other experiments also showed losses, from reasons sufficiently obvious in most cases; thus in No. 17, the land (after feeding off the seeds with corn and cake) was well dunged and sown to rape—bone dust and dissolved bones being used—and then the rape fed off with plenty of cake; in No. 21 no crop was taken off and turnip manure had been used; in No. 22 the land had been dunged for mangolds and the leaves fed off by sheep; in No. 23 turnips were fed off with sheep, and 16 loads of dung per acre put on afterwards; in No. 24 mustard was fed off by sheep with cake; lastly in No. 10 old turf had only been broken up in 1886. With such previous cultivations as these, it would not be surprising even in a good season to find but little return from artificial manures when used in addition. In future experiments it would, I think, be advisable to give more attention to this matter of previous cultivation, and thus to the selection of land in a condition more likely to respond to the action of the artifical manures applied.

XVII.—*Remarks on the Wheat Experiments.* By Sir T. D. Acland.

We are again greatly indebted to Mr. Knollys, Chairman of our Experimental Committee, for the great amount of trouble he has taken in making all the arrangements for the Experiments on Wheat during the season 1888, which has been most unfavourable for testing the effect of artificial manures. Mr. Knollys also, though he has been suffering much pain, has carefully digested the results, and drawn some conclusions from the effects of the manures looked at in the mass rather than in detail, which deserve attention.

In the two last seasons I have endeavoured, by dividing the experiments into groups, to draw some subordinate conclusions as to what I called the practical outcome. I do not propose to make the attempt this year, partly on account of the unsuitable season, partly because I have been at work on other subjects; there is too much from my pen in the 'Journal' already, and the full returns reach me as the time for going to press draws near.

But I venture to supplement the Chairman's lessons from the average, which credit the mixture of nitrogenous and phosphoric manures with little more than 2 bushels increase, and, except in one column, with less than a quarter of a ton of straw.

I think the general reader who may not take the trouble to study the tables carefully in detail, may have his attention directed to one or two facts. There are more than twelve farms on which the increase on one or more plots exceeded 4 bushels per acre. On some of these farms there was evidence that the manures added 4 bushels and upwards on 3 plots—there are 12 cases of an increase of 6 bushels and upwards, including 4 of 7, and some rising to 8 and 9. I think when we have such marked evidence of the successful application of manures, we may attribute the deficiency on other farms to the weather and to accidental causes, more or less connected with the season, such, for instance, as porous soils liable to the washing out of nitrates in a wet summer. It is a noteworthy fact that out of the 12 farms on which a clear success is registered, 7 [illegible] the southern and western counties; the reason is not [illegible]

[illegible] must be borne in mind that the object of our Experimental Committee is not to discover general principles, nor to take [illegible] plebiscite or mass vote on the need for nitrogen or phosphate,

or on the relative merit generally of ammonia or nitrate. value of all these constituents of manure may be taken an established principle. What we aim at is to test the a cation of the principle to different soils, different crops, different conditions and rotations. For this end we desi interest a number of intelligent practical men in colle results. The comparison of these different results is n of detail. Especially do we need to enquire into the caus comparative failure in particular cases.

Among the cases of failure may be specially noted th Mr. Harris, near Stratton, No. 8, on which the Chairmar made a special remark well worth attention, but I am not that in a different season the result might not be different. another paper will be found the particulars of the marked on oats of artificial manure on Mr. Harris's land. One o most successful results all round is that of Sir John Shell land which, though on the border of the red sandstone stra is, unless I am mistaken, not very good wheat soil.

I cannot close these hasty notes without joining our C in his hearty expression of our obligation to the gentle have rendered so much assistance in what is a matter o public interest, and in his hope that they will continue to us. I may point to the action of hill-country men on Win Hill as an evidence of the interest awakened by the work c Experimental Committee and its able Chairman.

There appear to have been poor results on about 10 f and 5 cases on which, owing to the season, the experiment to be abandoned.

XVIII.—*Experiments on Barley at Killerton, Devon, showing the effect of the Fifth Year's Corn Crop in Succession.**

Reported by Sir T. D. Acland and Mr. W. Stevens.

Killerton Home Farm (Blackwell Field). Blackwell Barley, 1888. (The fifth Corn Crop in succession).

Plot = ¼ Acre.	Manure.		Head Corn.		Tail Corn.	Weight per Bushel.	Straw.	Increase per Acre.	
								Head Corn.	Straw.
		lbs.	bus.	lbs.	lbs.	lbs.	lbs.	bus.	lbs.
1	Nitrate Soda	84	13	8	27	48	1100	+ 9⅔	+ 546
2	Nitrate Soda	168	16	30	30	49½	1392	+16½	+1130
3	Superphosphate ..	168	8	30	41	48	713	+ ½	− 168
4	Nitrate Soda .. .. Muriate Potash .. Superphosphate ..	84 56 168	14	32	48	48	1429	+12⅔	+1204
5	Nil		8	16	61	45	827	..	..
6	Nitrate Soda .. .. Muriate Potash ..	84 56	14	30	43	48	1375	+12½	+1096
7	Nitrate Soda .. .. Superphosphate ..	56 84	12	32	43	48	1016	+ 8⅔	+ 378
8	Nitrate Soda .. .. Muriate Potash .. Superphosphate ..	56 56 84	11	35	30	49	1106	+ 6¾	+ 558

Remarks:—Barley sown March 21st.

Supherphosphate distributed before corn drill, and harrowed in.

Muriate potash distributed March 22nd, and harrowed in.

Nitrate of soda distributed April 17th.

Plots 1, 3, 5, and 7, have had the same kind and quantity of manure for the last four years. The *extra* manure in the even number plots over the odd number plots, was added for the first time in 1887, and repeated again this year. The tail corn is omitted in calculating the increase per acre, as more than half of the tailing in plot 5 was tares, and there was much tailing in several of the other plots.

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* This is a continuation of the Experiments reported in vol. xix., 1887–8, page 260.

Plot 2 had the least tares, which is accounted for by the most even crop of straw.

In the other plots, where the straw was light, the tares were abundant, showing how desirable it is to grow good crops, not only for its own sake, but to keep down the growth of noxious weeds, which in the case of tares and wild oats takes years to get rid of.

It is proposed to drill next year's crop of barley about 10 inches between the rows of corn, so as to admit of hand hoeing.

The natural produce of the field, after five years' successive corn crops, is about 17 bushels per acre—as shown in Plot 5.

The application of superphosphate alone (Plot 3) appears to do no good—only a gain of ½ bushel of grain, and a loss in the straw of 168 lbs.

The result of this manure has been much the same in each previous experiment.

The double dose of nitrate of soda = 3 cwt. an acre (Plot 2), shows a gain of 16½ bushels of corn and 1130 lbs. of straw, being equal in money value to, say, 3*l.* 10*s.*, taking the corn at 3*s.* 6*d.* per bushel, and the straw at 1*l.* (a very moderate price) per ton. From this sum deduct cost of manure = 1*l.* 10*s.*, leaving a clear gain of about 2*l.* an acre.

It will be gathered from the above results that the heavy dose of nitrate of soda has not yet much exhausted the soil.

Potash seems to give good results.

Plot 8, from some cause not understood, has not come up to expectation.

It will be observed that the yield is not a heavy one; but it must be borne in mind that the season has not been a favourable one, and the land is not the most suitable for a barley crop.

W. STEVENS.

The most noteworthy point I think in this experiment is that the weed was kept down in Plot 2, simply by good feeding of the crop, not by mechanical means. The barley prevented the weed coming up.

On the other hand, in plot 5, a weed, the seed of which must have been lying underground for half a century—the land was always well farmed—smothered the barley, which suffered from sheer poverty in a bad season.

T. D. A.

XIX.—*Experiments on Oat Crop on Winsford Hill.*

It is with very great pleasure, and something of pride in our hill country that I send a report on experiments tried on Winsford Hill, at about 1000 feet high. It is of course not a corn country, though I have been in the habit of boasting that we grow a particular kind of oats, four-footed, which walk to market. But although the soil has been fed by what was left behind, as well as the live stock were by what went to market, we have been rather wishing to find out what was deficient in the soil, as it did not seem to yield as well as in old times. One of my friends, I believe, would maintain that the missing link was lime. Certainly the liberal use of lime, on the farm in question, has been concurrent with an unusual appearance of high condition and good farming. And whatever may be said in Sussex, the value of lime on hills near Exmoor is unquestionable, especially on grass, but probably also on roots and corn.

It has often occurred to me that in a breeding district the phosphates might be walking to market, and might need to be replaced; and on those thin coverings of the rocks the store of nitrogen can hardly be abundant. But I hardly expected to see at once so striking a proof of the advantage of phosphate as Mr. Lovelace's experiment shows. Especially as just forty year ago we began, following the example of the Vicar of Winsford, Mr. Mitchell, to import bone and superphosphate into the hills; and have, I believe, continued the practice, supplementing it lately with cake.

The annexed tables (pages 260, 261) show the successful manner in which the experiment reported was carried out by Mr. Amos Lovelace and his son.

The first plan shows how the experiment was laid out. Three strips, respectively 8 chains long × 125 links each = one acre, were manured with nitrogenous manures; two with sulphate of ammonia, and one with nitrate of soda, 1 cwt. of each. Between these strips two widths of 62½ links, each half an acre, were left without nitrogenous manures. Across these strips, in the centre of the field, 3 cwts. of superphosphate were sown over one acre, 2 chains by 5 chains. Thus there were four plots with sulphate of ammonia alone, two plots with nitrate of soda alone; four plots with no manure; two small plots with superphosphate alone; two small plots with sulphate ammonia and superphosphate; one small plot with nitrate soda and superphosphate.

On the same plan the particulars of each plot are given, so that the produce of every plot is in duplicate, and can be

compared with another. Only it must be noticed that on the one acre manured with superphosphate the width of the plot is 200 links, while those on each side of it are 300 links wide. An addition therefore of 50 per cent., or one half, must be made to all the centre plots to compare them with their respective flankers (to use a military term).

In the second plan, together with the cost per acre of the manure, the produce per acre on the average of the several plots is given. The details will, no doubt, be carefully examined by those who are interested. But, to save the general reader trouble, I may give the practical outcome shortly, arranging the plots in a slightly different order; so as to show (1) the small result of the nitrogenous manures, by themselves; (2) the effect of phosphate by itself, on the grain, but not on the amount of straw; (3) and the remarkable effect of the nitrogen and phosphate combined. It was, I believe, noticed that the phosphate plots were much the earliest, in accordance with what Mr. Warington says in his Handbook, that the use of superphosphate tends to early maturity of corn crops, especially barley:—*

	Grain.		Incr. +. Decr. −.		Straw.	Incr. +. Decr. −.
	Bush.	lbs.			Lbs.	
No Manure	41	23	..		3,041	..
Sulphate Ammonia	40	0	− 1	23	3,238	+ 197
Nitrate Soda	40	7	− 1	14	3,296	+ 255
Superphosphate	49	32	+ 8	9	3,088	+ 47
Sulphate Ammonia and Phosphate	60	0	+18	17	3,854	+ 813
Nitrate Soda and Phosphate	58	12	+16	29	3,904	+ 863

The oats were sown on a high open field after four years' ley. It had been seeded down, 1883, after roots fed on the land without a corn crop, according to the excellent practice of our best hill-farmers, or, as we might call them in a double sense, high farmers.

1884, young grass; 1885, second year grass; 1886, third year grass; 1887, fourth year grass. Spring of 1888 broken for oats.

Seed oats, Improved Tartarian, 6 bushels; sown broadcast April 6th, 1888.

Application of manure:—April 14th.

* Warington, Handbook, 'Chemistry of the Farm,' 1886, p. 36.

Plan 1.

Width	Manure	Bush.	lbs.		Manure	Bush.	lbs.		Manure	Bush.	lbs.	
	The Plots in this column are alternately $\frac{3}{8}$ of an acre = 1 r. 20 p.; and $\frac{3}{16}$ of an acre = 30 p.				The Plots in this column are alternately $\frac{1}{4}$ of an acre = 1 r.; and $\frac{1}{8}$ of an acre = 20 p.				The Plots in this column are alternately $\frac{3}{8}$ of an acre = 1 r. 20 p.; and $\frac{3}{16}$ of an acre = 30 p.			
	3 Chains.				2 Chains.				3 Chains.			
Links, 125.	Ammonia	18	30	Head Corn.	Ammon. + Phosph.	15	12	Head Corn.	Ammonia	14	28	Head Corn.
		2	3	Tail Corn.		1	34	Tail Corn.		1	29	Tail Corn.
			1392	Straw.			1062	Straw.			1100	Straw.
Links, 62½.	No Manure.	9	26	Head Corn.	Phosph.	6	23	Head Corn.	No Manure.	7	7	Head Corn.
			35	Tail Corn.			32	Tail Corn.			35	Tail Corn.
			671	Straw.			423	Straw.			559	Straw.
Links, 125.	Nitrate	15	22	Head Corn.	Nitrate + Phosph.	14	21	Head Corn.	Nitrate	14	19	Head Corn.
		34	0	Tail Corn.		1	33	Tail Corn.		1	30	Tail Corn.
			1447	Straw.			976	Straw.			1025	Straw.
Links, 62½.	No Manure.	7	34	Head Corn.	Phosph.	5	30	Head Corn.	No Manure.	6	13	Head Corn.
		1	0	Tail Corn.			35	Tail Corn.			30	Tail Corn.
			535	Straw.			349	Straw.			516	Straw.
Links, 125.	Ammonia	13	27	Head Corn.	Ammon. + Phosph.	14	24	Head Corn.	Ammonia	12	22	Head Corn.
		1	22	Tail Corn.		1	31	Tail Corn.		1	18	Tail Corn.
			1260	Straw.			865	Straw.			1105	Straw.

Note—Ammon., means Sulphate of Ammonia. Nitrate, Nitrate of Soda. Phosph., Superphosphate.

PLAN 2.—*Results calculated per Acre.*

How Manured.	Quantity per Acre.	Cost of Manure.	Produce of Grain and Straw.		Weight per Bush.	Total Value of Crop.	Increase or Decrease of Value.		Net Gain by use of Manures.	Net Loss by use of Manure.
							Increase.	Decrease.		
	Cwt.	£ s. d.		Bush. lbs.	Lbs.	£ s. d.	£ s. d.	s. d.	£ s. d.	s. d.
Sulphate of Ammonia ..	1	0 12 10	Head Corn Tail Corn Straw ..	40 0 4 24 3238	36	5 15 9	..	2 4	..	15 2
No Manure	..	..	Head Corn Tail Corn Straw ..	41 23 5 0 3041	,,	5 18 1	..	..	..	..
Nitrate of Soda	1	10 6	Head Corn Tail Corn Straw ..	40 7 5 0 3296	,,	5 17 0	..	1 1	..	11 7
Sulphate of Ammonia Superphosphate	1 3	1 1 10	Head Corn Tail Corn Straw ..	60 0 7 22 3854	,,	8 5 6	2 7 5	..	1 5 7	..
Superphosphate	3	9 0	Head Corn Tail Corn Straw ..	49 34 7 16 3088	,,	6 18 6	1 0 5	..	0 11 5	..
Nitrate of Soda .. .. Superphosphate	1 3	19 6	Head Corn Tail Corn Straw ..	58 12 7 24 3904	,,	8 2 11	2 4 10	..	1 5 4	..

Value of Head Corn, 2*s.* per bushel; Tail Corn, 1*s.* 6*d.* per bushel; Straw (consuming price), 20*s.* per ton.

First rain after application of manure, April 17th.

Plot manured with superphosphate, cut September 22nd, and carried October 2nd.

The other plots were cut September 29th, and carried October 8th.

Oats threshed from 10th to 15th of January, 1889.

Soil, light and dry, gravel subsoil.

Altitude, about 1000 feet above the sea-level.

It must be obvious to the reader how skilfully the several plots were laid out and measured by Mr. Lovelace and his son. I have carefully verified the figures, and have been able to judge how accurately the work was done, and the calculations made.

The same experiments were, as far as circumstances permitted, carried out on a similar plan by Mr. Glass, of Broford, on a hill overlooking the Exe Valley, and by Mr. Webber Harding on another part of the hill, overlooking the Barle Valley; both fields nearly one thousand feet high, and adjacent to a heathy common.

Mr. Glass's field was rather uneven as to depth of soil, part rather peaty; it had been well dressed in the previous year for turnips, and the turnips were fed on the land with cake. The land was, in fact, in too good condition to test the effect of a small application of artificial manure, the only apparent gain being two bushels on the plot manured with sulphate of ammonia and phosphate.

Mr. Harding's field was also in fair condition; it had been well limed about eight years ago, and was broken after two years' grass. If the season had been favourable there seems good reason to think that a considerable increase would have been produced by the manures.

The oats were drilled on the 9th of April, and soon after manured. Heavy rain came on the 22nd. The super-phosphate plot showed first. Heavy rains followed, and beat down the crop.

An unfortunate mistake was made in thrashing; the no manure and the phosphate plots were mixed. As far as I have been able to obtain information, it appears that the land which had no nitrogenous manure produced thirty-three bushels per acre in round numbers, the plots manured with sulphate of ammonia and nitrate of soda each about forty-three bushels; but we have no clear evidence in this case of the effect of the phosphate, except in the early start given to the crop.

I think that it is a very encouraging circumstance that three young farmers, guided by a person of the wide experience of Mr. Lovelace, should have worked together with so much

intelligence and desire to get at the truth. On the whole we may be justified in the expectation that in a favourable season both phosphate and nitrogen will prove themselves serviceable to the hill-country farmer.

There are unmistakable signs of the interest awakened, even in out-of-the-way places, by the experimental work of the Bath and West of England Society.

T. D. ACLAND.

XX.—*Experiments on Oats on Shernick Farm, in the Parish of Launcells, East Cornwall,* 1888.

½-ACRE PLOTS.

Plots.	Manure per ½ Acre.	Cost per Acre.	Head Corn.	Tail Corn.	Weight per Bushel.	Straw.	Increase per Acre. Corn.	Increase per Acre. Straw.
	lbs.	£ s. d.	bus. lbs.	bus. lbs.		lbs.	bus. lbs.	lbs.
O	No Manure	..	8 9	0 32	..	954	..	..
P	Nitrate of Soda .. 70 Superphosphate 168	1 1 0	19 12	1 27	..	1395	21 4	864
Q	Sulphate of Ammo. 56 Superphosphate 168	1 1 0	22 20	1 13	..	1453	26 30	980
R	Sulphate of Ammo. 56	0 13 6	10 12	1 17	..	1020	2 22	114
S	Nitrate of Soda .. 70	0 13 6	11 19	0 30	..	956	3 24	−14*
T	No Manure	..	11 3	0 30	..	972	..	..

* A decrease on the straw = 14 lbs.

Remarks:—The unmanured plots produced 21 bushels an acre. By spending 1*l.* 1*s.* an acre in nitrate of soda and superphosphate (Plot P.), the produce in grain was exactly doubled, and there was an increase in the straw of 864 lbs., this increase in corn and straw being equal in money value to 2*l.* 10*s.*, or a clear gain, after deducting cost of manure—say 30*s.* an acre.

In the next plot (Plot Q.), by spending the same sum, 1*l.* 1*s.*, in sulphate of ammonia and superphosphate, a greater gain was the result, viz., 26¾ bushels of corn and 980 lbs. of straw, worth say 3*l.* 3*s.*, which, after deducting cost of manure, leaves a gain of 2*l.* 2*s.* an acre.

In Plots R., sulphate of ammonia alone, and S., nitrate of

soda alone, there is a small gain of about 6*s*. an acre, but this is not sufficient to pay the cost of manure.

It will appear from the foregoing facts that superphosphate has produced by far the best results.

The land was coarse, and had not been broken for several years.

A good deal of permanent clover came up in the plots in which superphosphate had been applied.

W. STEVENS.

This was a first experiment on some of the very poor clay land, between Dartmoor and Bude, on the North Coast; some of the land is not worth 5*s*. an acre.

The unexpected effect of phosphate of lime is very remarkable.

I am informed that a sprinkling of superphosphate over the rest of the field outside the experimental plots showed a most remarkable result in the produce of White Dutch Clover.

T. D. A.

XXI.—*Grass Experiments at Killerton, Fourth Year.*

THESE experiments are a continuation of those already reported on in vol. xix., with seven additional plots. The object is to ascertain whether the application of nitrogenous and mineral manures, separate or together, will pay. Lime, bones, and dung have been added during the past year. Of course the hay cut is an imperfect test of the effect on pasture.

The nitrogenous manures, in almost every case, show an increase of half a ton; nevertheless the minerals, bone, superphosphate, potash and lime may do more good to the pasture.

The seven plots on the north side and west side were enclosed for the first time in the spring of 1888. The nine plots inside the double line on the plan have been mown and reported on in the 'Journal' for four years.

Each plot being one square chain, or the tenth of an acre, every hundredweight therefore may be read as representing half a ton per acre.

We have noticed every year the tendency of the ammonia and ...es to increase the gross produce and the coarser grasses.

The experiment can hardly be said to show any decisive practical result from the application of purchased manure to good old pasture.

It may, however, be noticed that the newly-enclosed plots, which had been previously fed off by sheep with additional food, turnips and cake, did not yield as much as those to which

nitrogenous manure had been applied, and the hay removed, for three years; but they were unstocked rather late, which partially accounts for the difference.

The dissolved bone in the plot on the north-west, and the nitrate of soda, with potash and lime, on the north-east, are the only new plots which show a decided increase. The dung was applied rather too late in the season to take effect.

We have endeavoured to keep the nitrogenous manures from north to south, and the minerals crossing from west to east.

Grass Experiments, "Cross Field," 1888.

Each Plot = one square chain.

N.

W. | E.

Diss. Bone alone. = 2 cwt. an acre. cwts. qrs. lbs. 5 0 7 hay.	Lime and earth. Lime = 8 hhds. an a. cwts. qrs. lbs. 4 1 21 hay.	Lime alone. = 8 hhds. an a. cwts. qrs. lbs. 4 1 21 hay.	N. Soda =1 cwt. an a. M. Potash=1 „ „ Lime =2 hhds. „ cwts. qrs, lbs. 5 0 14 hay.
Dung alone. = 10 loads an acre. cwts. qrs. lbs. 4 3 14 hay.	Sul. of Ammonia. = 100 lbs. an acre. Super. = 3 cwt. an a. cwts. qrs. lbs. 5 2 0 hay.	Super. alone. = 3 cwt. an a. cwts. qrs. lbs. 4 2 21 hay.	N. Soda = 1 cwt. an a. Super. = 3 „ „ cwts. qrs. lbs. 6 0 0 hay.
Nil. cwts. qrs. lbs. 4 1 0 hay.	Sul. of Ammo. alone. = 100 lbs. an acre. cwts. qrs. lbs. 5 1 7 hay.	Nil. cwts. qrs. lbs. 4 2 0 hay.	N. Soda alone. = 1 cwt. an acre. cwts. qrs. lbs. 5 1 7 hay.
Cotton Cake. = 2 cwt. per acre. cwts. qrs. lbs. 4 3 0 hay.	Sul. of Ammonia. = 100 lbs. an acre. Super. 3 cwt. „ cwts. qrs. lbs. 5 3 0 hay.	Super. alone. = 3 cwt. an. a. cwts. qrs. lbs. 4 3 14 hay.	N. Soda = 1 cwt. an a. Super. = 3 „ „ cwts. qrs. lbs. 5 1 7 hay.

S.

Superphosphate sown March 20th.

Nitrate of soda, sulphate of ammonia, muriate of potash, dissolved bone, and dung applied April 30th, and May 5th.

Cotton-cake sown May 5th.

Lime „ „

Lime and earth „ „

Lime had from Newton Abbott. 1 hhd. = $7\frac{1}{2}$ cwt.

T. D. A.

XXII.—*On the Chemistry of Farming.* By Sir T. D. Acland.

Introduction.

I wish to make one more attempt, probably it will be my last, to assist my Agricultural friends to gather useful information from the accumulated result of the work done by scientific enquirers. The combined experiments conducted by practical men in conjunction with our Society have awakened a widespread interest. I think there is an increasing willingness to believe that there is much to be learned beyond the repetition of each farmer's experience.

With this impression on my mind, I took up one of Sir John Lawes's papers on the action of Manures, believing that it would throw much light on our experiments at the present time.

But it seemed to me that to bring this matter home to practical men, it was needful to translate some of the chemical language of the present day into the mother tongue. I have since noticed that some of my friends are really desirous to know more of the meaning of the chemical principles now commonly recognised than is conveyed by the usual recipes for manures. I confess that I have found my self-imposed task more difficult than I expected. The whole vocabulary of Chemistry has been changed within the half century of the existence of the Royal Agricultural Society, whose jubilee is about to be celebrated at Windsor. Old principles have been modified by new discoveries and adapted to new theories, and great practical results in the way of technical work have been attained in other arts besides that of Agriculture.

I must begin by disclaiming all intention of attempting to teach Chemistry to practical men. Neither do I suppose for a moment that the reading of an article in a journal can do much for the education of the young. To learn chemical principles young men must go to work at experiments with their own hands in the laboratory. There are a number of excellent manuals and some execrably bad ones, which seem to have an extraordinary run as cram-books for certain examinations. Such books make an old man marvel at the powers of memory which young ones can call into action. But there are manuals admirably fitted for the training of the mind and hand of those who have access to laboratories, private or public.*

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* I need not repeat what I said in a former volume, of the value of Sir H. Roscoe's 'Primer on Chemistry,' published by Macmillan for one shilling. I would advise every young farmer to get it; I have made many references to it, as I know no book so well adapted to beginners.

I also most strongly recommend to all who desire trustworthy information on scientific questions interesting to the farmer, to study the three Handbooks,

To such sources of knowledge it is my object to lead enquirers. I do not attempt a systematic description of chemical elements or gases; still less do I propose to give verbal definitions of unseen things, or to expound abstract principles arrived at by great thinkers. I propose to take a few common objects of everyday experience, animals and vegetables, and trace them backwards to their origin; and also to put into common words a few truths which in a hard scientific form repel the practical man.

I hope for indulgence, if in the desire to be practical and simple I should appear to be sometimes not sufficiently precise or distinct.

I must, however, specially acknowledge the kind encouragement and assistance which I have received from Mr. Maskelyne, Dr. Voelcker, and Mr. Lloyd.

If we consider the production of animals ready for the butcher and for human food as the most advanced outcome of practical agriculture, we may try back to find out the steps by which we can attain our end. In other words, we may ask from what materials this animal structure is built up; that is to say, from what food the fat, flesh, and bone, are produced. First of all, the food of the young animal is its mother's milk, which therefore must contain fat, and flesh, and bone, or at least the materials for making them. We may enquire, by the way, whether we can increase the butter or the cheese in the dairy

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'Chemistry of the Farm,' by Warington, 'Plant Life on the Farm,' by Dr. Maxwell Masters, and 'Animal Life on the Farm,' by Professor George Brown, of the Agricultural Department. Price 2*s.* 6*d.* each.

Professor Crum Brown's 'Manual of Chemistry,' Chambers's Series, has been used by Professor Wallace, with the Agricultural Class at Edinburgh.

An elementary text-book on 'Inorganic Chemistry, Theoretical and Practical,' by William Jago, F.C.S., F.I.C., Science Master at Brighton, 9th edition, Longman, 1888; though avowedly written to prepare candidates for examinations at South Kensington and the London University, appears to be an honestly educational work. It is in use at the Blundell Grammar School, Tiverton, where there is a fully furnished laboratory. Mr. Spring, the Science Master, introduced me to the book, and otherwise kindly assisted me. I have found the book very useful; but it is too difficult for a beginner by himself.

Since this paper was all but finally revised for the press, I have just discovered among the text-books of Science in Longman's Series an 'Introduction to Chemistry,' which was completed just before the death of the author, by my late friend, Professor Miller, of King's College, in whose laboratory I gained, just forty years ago, the little practical knowledge of Chemistry which I have tried to turn to account in Agriculture. I was aware that he had written a large and important work in several volumes; but I assumed that it would be too elaborate for my present purpose, and I have not had it at hand to refer to. This small text-book, beyond any with which I have made acquaintance, seems to me adapted to the wants of the general reader who has had a good education. It is written in simple, pure English, dealing with practical realities, never using a technical word without sufficient explanation, and introducing abstract principles gradually. All that I can now do will be to make a few references to the book in notes. New edition, 1885. Price 3*s.* 6*d.*

by regulating the food of the cow. We then have to ask what are the constituents of the vegetable food of the animal, whether they are matured in the plant, or changed in the body of the animal. Lastly, we must enquire from what sources do vegetables derive their nutrition; does their food come out of the soil, or out of the air, or both? and how can we influence the quantity and quality of the vegetable food, either by manure or by any management of the soil, or of the growing plant?

In all these questions we are assuming that animals and plants are making regular and healthy progress. There are, besides, many important considerations as to the effect of diseases and of bad seasons. Into those important and sometimes anxious questions it is not proposed to enter here.

MEAT, WHAT IS IT?

To begin then with the fully developed animal. The marketable produce to be sent to the butcher consists of three principal parts; the chemical constituents of which are distinguished by clear differences. Those parts are Fat, Flesh, Bone.

As regards man who eats the meat, fat is called, in all scientific treatises on food and cookery, a body warmer; fat burns, as we see in a tallow-candle, and leaves nothing, nor does it when burnt cause a marked smell like burnt hair or wool. It has also been proved by the late celebrated Dr. Parkes of Netley Hospital, that fat and other compounds of like constituents, when eaten, will do muscular work; that is, produce and sustain force, as coal in a steam-engine generates force, and transmits it through the machinery.*

The lean meat, on the contrary, when burnt, is characterized by a particular odour like burnt hair, which the chemist recognizes as an indication that there is in flesh a particular constituent which is not to be found in the fat. There is also another distinguishing feature. Flesh, if exposed to the air, begins in a few days to putrefy; fat does not so putrefy, as you may perceive by examining a jar of potted meat. The lean meat is preserved by a covering of clean fat, which does not putrefy, and does keep out the air from the meat. Neither fat nor flesh when burnt

* See Dr. Pavy, 'Treatise on Food,' 1874:—"According to the view propounded by Liebig, nitrogenous matter alone constitutes the source of muscular and nervous power. . . . Liebig's doctrine was at once accepted, and until recently had been looked upon as expressing a scientific truth. Like many of the author's views, its plausibility was such that no one ventured to question its soundness." p. 38.

may record the fact that on the appearance of Liebig's doctrine, the late Lord Spencer wrote a letter to Mr. Pusey, which I saw, saying he was sure it [illegible] and that it would some day be disproved.

leave any considerable quantity of ash. But flesh burns very slowly.

Lastly, bone is principally composed of mineral matter. I speak of dry bone after the jelly has been boiled out. The cartilage which by boiling becomes jelly or gelatine is similar as regards its chemical elements to the flesh; though doctors seem to doubt whether it is really nutritious, whatever the cooks may say about thick stock or calves-foot jelly.

The mineral matter of the bone is principally composed of phosphate of lime, and a small quantity of ordinary lime.

There are also in various parts of the animal some small portions of sulphur, potash, and iron. Such then are the three constituent parts of the animal, we must not say exactly of animal food as eaten by man; for the mineral part of the bone, whatever it may do for the dog or the fox, is hardly food for man.

MILK.

Next comes milk. It is obvious that, as a human infant or a calf or lamb can be brought up on its mother's milk alone, this milk must contain the three substances of fat and flesh and bone in some form.

The fat in the butter burns away like the fat of the carcase, without smell and without ash. The cheesy matter (casein) is distinguishable by the same marks as the flesh. It soon causes milk to turn bad or sour, it is in fact one main cause of bad butter, when not thoroughly washed out. There is left, when the cheese is burnt, a residue which corresponds to the hard part of bone.

In passing I may remark, as has often been said before in this Journal, and cannot be repeated too often, how very important is skim-milk for the nourishment of poor children, containing as it does all that the growing body needs except fat, which can be bought in a cheaper form than butter, such as bacon or dripping.

VEGETABLES—WHEAT—TURNIPS.

The same threefold division applies to vegetable food. If we take wheat, the staff of man, as a type, we can easily separate the flour into its corresponding constituents. Put a spoonful of whole-meal flour into a bit of muslin (or on a fine sieve) and pour water on it, or squeeze the cloth as long as a white liquid will come through. This is starch; what is left is chiefly gluten: they are distinguishable like fat and flesh by the test of the smell of burnt hair, and when the whole, especially the gluten, is burnt, there will be a slight residue of mineral ash corresponding approximately to the constituents of bone.

Now what is the principal element of the fat formation? Let us try a very simple experiment on the food of animals, roots (turnips or mangold).

Take 10 lb. of roots and slice them, and bake them in a hot oven, till they are black; then weigh them again, you will find only 1 lb. In other words in every cwt. of roots there has been 90 per cent. of water removed by evaporation, simple drying. The black stuff left is chiefly charcoal or carbon. Burn that black stuff in any iron pot, and you will find one tenth of a lb. of ashes. That is to say, in a ton of roots you have only 2 cwt., or 10 per cent., of dry solid matter, and of those 2 cwt. only about 20 lb., or 1 per cent. of the whole produce, is directly drawn from the hard materials of the soil.

In this hasty analysis of roots, I have not drawn any attention to the distinction between fat-formers and flesh-formers. I want to impress on you the fact how very small is the earthy or mineral matter which comes out of the soil, and that the bulk of the dry matter after the water has been evaporated, is carbon.

Where then are we to look for the answer to the questions contained in the title of two excellent books, 'How Crops Grow,' and 'How Crops Feed'?

I might have gone on to show you the different elements of food in barley, oats, beans; in hay and straw, and in various so-called artificial foods. But we may come to these details further on.

But first let me put before you the substance of what I have said so far in a tabular form, which may help your memory.

	A	E	O
Meat	Fat	Flesh (lean)	Bone (dry).
Milk	Butter	Cheese (skim) ..	Mineral ashes.
Wheat ..	Starch	Gluten	Ditto.
Distinctive characters.	Easily burn. Do not easily putrefy. Do not give off ammonia.	Do not easily burn. Do putrefy. Do give off ammonia.	Do not burn at all. Do not putrefy. Do not give off ammonia.

The vowels A, E, O, occur respectively in the words, fat, flesh, bone, and may serve as an aid to the memory.

THE (OLD) FOUR ELEMENTS.

In a short paper which appeared in the Bath and West of England 'Journal' two years ago, a reference was made to the

old idea of the four Elements (so called), Fire, Air, Water, and Earth, as illustrating the action of heat or sunshine, the inhaling of what used to be called carbonic acid gas from the atmosphere by the leaves of plants, and the use of water as the means by which they draw some solid matter up through their roots, from the soil.

It is now proposed to carry on this illustration a little further in a homely fashion; using very plain words as an introduction to what, if the reader is not tired, he will find at the end; namely, some explanation of the hard scientific terms which are commonly introduced by writers on what is called the Science of Agriculture, or Agricultural research.

I must frankly confess that on former occasions I have been, perhaps unduly, prejudiced by the introduction into writings intended for practical farmers of new terms which seemed to me more likely to astonish or to repel, than to instruct.

But I am bound to admit, after some careful study, that the progress of Chemistry has made a great change of language unavoidable, and that the modern nomenclature is truer and more instructive than the old. It is also evident that all young persons who aspire to pass examinations either in the Science Schools, or with a view to qualify for some professions, must learn the new language, whether they really understand it or not.

It will be my humble endeavour to help the young farmers at least to attach some practical meaning to words which are now generally adopted in scientific works of the highest authority.

But before we embark on this technical voyage towards a new and unknown country, let us first go on talking plain English for a few pages; and, as we go on, let us make acquaintance with a few capital letters, and figures of a mathematical look, which, if used too freely at first, only repel the learner.

I must ask any scientific reader, especially if he happens to have written a text-book, to be merciful, if I do not attempt much abstract or accurate definition at the outset, or fail in my desire to simplify the expression of the truth.

The plan usually adopted in chemical lectures and text-books is to exhibit or describe experiments; showing in detail the behaviour, as it is called in the laboratory, and possible combinations of all the known elements, one after another: and also to lay down in very precise abstract scientific terms certain fundamental laws of nature. The bearing of these laws on the facts of common life usually comes later.

When Chemistry is taught as a branch of general or professional education, with a view to the training and discipline of the mind, this may be the right course for the teacher to

adopt. But I think it is not the way to help the practical farmer to understand the reasons of his own practice, or to improve upon it. In the first place, he has not access to chemical laboratories. His farm is his laboratory; and if he has not an exact or precise knowledge of causes, he has a very practical experience of results. At first sight, gases and symbols seem to him vague and unmeaning. It seems better to begin with experience and work back to principles. This is called the *analytical* method, as distinguished from the *synthetical;* as if we took to pieces an old machine, in order to understand how each part works, and to be better qualified to repair it and put it together in good working order.

WATER.

Let us begin with water (we will come to fire presently). What is water? I mean pure water. Spring water and river water are not pure water, they always contain some mineral matter, and often some gas, or vegetable or animal matter. Rain water is nearly pure, not quite. We must first grasp firmly an idea, which is not obvious to every one. Solids, liquids, gases, are not different things. They are different states of the same things. *Pure water is not always a liquid.* It is so at ordinary temperatures. If water is heated enough it becomes a gas called steam; if it loses enough heat it becomes a solid. Water gives off steam, gas, or vapour from its surface at all temperatures; but the temperature at which it boils does not depend only on heat; pressure must also be taken into account. On the tops of very high mountains water boils at a lower point, because the pressure of the air is lighter. But we need not dwell on these points for our present purpose, important and interesting as they are.*

What is water made of? is it a simple element which cannot be decomposed? No. It is not simple, it is made up of two elements, which, when free or uncombined, are gases. This was discovered only just one hundred years ago. As to the meaning of the word "element," see note below.†

One of these gases was at first called "Vital air" (we shall presently hear of another kind of air called "fixed air"). But

* One of the standard works on Chemistry, by Fownes, edited and enlarged by Watts, opens with these words:—"It is of great importance to understand clearly what is meant by the terms *density* and *specific gravity.*" But it is very difficult for the untrained mind to understand the explanation merely by reading.

† Sir Henry Roscoe thus defines element and compound:—

1. Simple bodies or elements—substances out of which nothing else can be got.
2. Compound bodies—substances out of which two or more different things can be got.—'Primer,' § xvi. p. 75.

this vital air soon acquired the name Oxygen, because it was supposed to be the generator of acid (Oxy- being Greek for sharp or sour). This doctrine about acids is now abandoned. But we shall see that oxygen enters into almost all things. More than half the weight of the world is oxygen.

The other gas of which water is made is of special importance in chemistry, as it is the lightest substance (capable of being weighed) in the universe, as far as we know, and therefore the unit of all comparative weights and measures. It used to be called "inflammable air." It is, in fact, an important element in the flame of candle, lamp, or coal. But it soon acquired the name Hydrogen (Hydr- being Greek in composition for water) as the generator of water. It is also very important as a component of all vegetable and animal products, and is therefore diffused throughout nature.

These two gases can be shown to rise out of water by a very simple and beautiful experiment.* The two gases, Oxygen and Hydrogen, will be collected in two inverted glasses or closed tubes; and, observe, one tube gets twice as much gas as the other tube, as regards space, bulk, or what chemists called *volume*, not weight. If there is half a pint in one tube, there will be a pint in the other—the half pint will be Oxygen, the whole pint will be Hydrogen—this, you observe, is measure, not weight. But now for weight. Chemists can weigh gases easily; the oxygen, though only half the bulk, is eight times the weight of the hydrogen.

Now, this is of the utmost importance, it is a fundamental principle of chemistry—the extent of its application is very far reaching.

AIR.

We must now speak of the Air or Atmosphere. The atmosphere *contains* two gases; observe I do not say is *composed* of two gases, because the air is not a fixed chemical compound; it is only a mixture. We shall see presently what we mean by a compound.† Vital air, then, or oxygen, is part of the mixture; it is what is essential to our lives when we breathe; it is what is essential to the flame of the candle and the burning of coal in the fire. If there were nothing else in the air to dilute this inspiriting life-exciting air, we should go off in a few minutes into a fever and die.

The other gas is called Nitrogen, because it was found in Nitre or Saltpetre. As it exists in the air (only mixed not

* Roscoe's 'Primer,' "Water," § vi., Experiment 12.

† As to the distinction between *elements* and *compounds*, see opening chapter of Miller's 'Text-book,' p. 3, and as to *mixture* and *combination*, p. 14.

united) with oxygen, it appears to act merely in the way of diluting the active vital air. We shall learn by-and-by the paramount importance of nitrogen to the agriculturist; and its powerful action when in *chemical combination* with oxygen; but it is rather shy of union with other bodies. When we come to speak of Ammonia, Nitric Acid, and Nitrates, the value to the farmer of nitrogen will be plain.

The proportion of oxygen in the air is about one-fifth by measure, that of nitrogen about four-fifths.* But in 10,000 measures of air there are from four to six measures of another gas, to which I must now ask your attention.

Strange indeed as it may seem, this small proportion of gas is what forms or feeds the bulk of the vegetables, and through them all the animals on the earth. This gas was called "fixed air," when it was first discovered. It is this gas which is driven out of limestone in the lime kiln; it is the deadly gas found sometimes in deep wells, and in the bottom of brewers' vats; it is the unwholesome air in a crowded room; it is the gas which is produced by the burning of coals, and candles, and charcoal. But, nevertheless, it is the source from which, if you omit water, much more than half of all your crops and of the bodies of your live stock are derived.

You have often heard this gas spoken of as Carbonic Acid gas. In modern chemistry it has taken a new name; indeed more than one name,† which is rather puzzling for young farmers, but in this transition of names (troublesome as it is to old stagers also) we really see the growth of sound theory, and the advance of knowledge and the understanding of facts.

As to the nature of this carbonic acid gas, I will only say at present that it is a chemical compound, not a mere mixture of carbon and oxygen. This compound is made up in strict

* The results of careful analysis of air freed from carbon dioxide and aqueous vapour give the following average composition:—

Nitrogen	79·19	..	76·99
Oxygen	20·81	..	23·01
	100·00	..	100·00

'Elementary Text Book,' "Inorganic Chemistry," by Jago, p. 171.

Miller gives the composition of the air *by measure*, in a litre or 1000 c.c., as follows:—

Oxygen	206·1
Nitrogen	779·5
Aqueous vapour	14·0
Carbonic anhydride	·4
Nitric acid, ammonia, carburetted hydrogen ..	traces
	1000·0

† Carbon-dioxide, or carbonic anhydride. See below, p. 282.

union when a portion of coal or oil, or other substance containing carbon, is raised to a certain heat in the open air.

FIRE.

And now we may answer the question above postponed, what is fire? more precisely, what is flame? or, as it is sometimes expressed, what do we mean by combustion or burning? We mean chemical union, which is generally accompanied by heat, and in this case by light also. The minute particles of carbon heated up to a certain point in a fire or flame already burning are raised to a greater heat on coming into contact with the oxygen of the air, but the outside zone of the flame is not the most luminous part of the flame. There is also some hydrogen in the oil or coal, and when that comes into contact with the air it forms water. This you may see by holding a cold glass for a second or two over a candle, where you will see water condense on the cold glass.

It is very important that you should understand what happens when a candle burns. Nothing is really lost. A simple experiment described by Sir H. Roscoe shows that in fact some weight is gained, for the substance of the candle has now united with it some oxygen from the air. The carbonic acid gas and the water so formed, can be weighed.*

I hope now you are satisfied that in the carbonic acid gas there is some carbon for the vegetables to feed on. If you need more proof, a very simple experiment will show you that soot or lampblack can be obtained from colourless carbonic gas. You may have a further proof in the growth of mustard and cress on flannel.†

Sir Henry Roscoe thus draws out the lesson of this experiment:—

"Whence did the growing plants get the materials necessary to form their stalks and their leaves? not from the flannel, for that remains unchanged; not wholly from the seeds, for the plants weigh much more than the seeds; not from the water alone, because the plants are building up stalks and leaves containing carbon, and this substance is not present in water. Where does the plant get the carbon it needs? From the air, we answer. A previous experiment, No. 7, showed that animals are continually giving out carbonic acid gas, and we are therefore sure that this gas must be present in the air, although perhaps in small quantity."

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* Roscoe's 'Primer,' § ii., Experiment 3, p. 14.

† Ibid. § v., Experiment 8, p. 26.

CHEMICAL PROPORTIONS.

I stated a little earlier that oxygen and hydrogen united in water in the exact proportion by weight of 1 to 8; for reasons which I cannot at present give you it is now always stated that the proportion is by weight 2 : 16. Hydrogen (a single dose) is always counted as *one*, every other element has its number. Oxygen is, bulk for bulk, sixteen times as heavy as hydrogen; in the case of water there is what, in unscientific language, I may call a double dose of hydrogen.

The figures which follow may represent grains, ounces, or pounds, in fact any weights; the proportion of weight is the point. The proportion of volume or measure is quite another matter, and more difficult.

Hydrogen.		Oxygen.		Water.
(*Double Dose.*)	+	(*Single Dose.*)	=	(*Compound.*)
2		16		18

In the case of carbonic acid gas (as it used to be called), there is a union of one dose of carbon with a double dose of oxygen. The combining proportion of carbon is 12, that of oxygen 16 as above stated; we have therefore

Carbon.		Oxygen.		Carbonic Acid.
(*Single Dose.*)	+	(*Double Dose.*)	=	(*Compound.*)
12		32		44

Now this proportion is always maintained for this compound. There is another compound of carbon with a single dose of oxygen; but that is not a food of plants, so we will not say more about it now; it used to be called carbonic oxide. It may be seen in the fireplace when the fire burns blue.

There is another compound of which you have often heard, that is Ammonia; that also has had to undergo, if not a change of name, at least an important change of relationship. But let me speak of it first in its old style. I told you that nitrogen was an important food of plants; they cannot get it direct from the air in its simple form. It comes to the service of the farmer at first in the form of ammonia, and probably has to make another change in the soil, or two changes before it becomes plant food.* Ammonia is composed of a single dose of nitrogen, and a triple dose of hydrogen. The combining number of nitrogen is 14, that is, a pint of nitrogen is fourteen times as heavy as a pint of hydrogen. The compound is thus formed

Nitrogen.		Hydrogen.		Ammonia.
(*Single Dose.*)	+	(*Triple Dose.*)	=	(*Compound.*)
[illegible]		3		17

* See Paper No. XXIII., on the Action of Manures.

You often see at the foot of an analysis a certain percentage of nitrogen with a further entry "equal to ammonia, so much;" the proportion is always, nitrogen, 14; ammonia, 17.

VOLATILE AND SOLID CONSTITUENTS.

Thus far we have been engaged with what are sometimes called the volatile constituents of plants and animals. By volatile we mean first, that they are directly or indirectly derived from the atmosphere; and secondly that, when life is extinct and decay or putrefaction ensues, these constituents are again dispersed in the form of gases; only a small quantity of ashes being returned to the earth. I ought perhaps to have included two more constituents, sulphur and phosphorus. When we come to speak of the compounds forming parts of animals, we shall find that sulphur always enters into the flesh (and therefore into some kinds of vegetable food) to a small extent, and into hair and wool to the amount of from 3 to 5 per cent. Phosphorus, though it is difficult to prevent it in a pure state from taking fire, enters into plants and animals chiefly as phosphate of lime, of potash, of soda, or of magnesia.* And therefore though itself, when free, very combustible and volatile, it may be found in the mineral ashes.

MINERALS.

We will now pass on to the non-volatile parts of plants. Those constituents of plants are to be found in the ashes left after burning. They are almost entirely minerals. Some of you may be old enough to remember that Liebig put forward a mineral theory of manure, and even proposed a patent mineral manure, consisting of the elements of plants as found in their ashes. That proposal led to the famous controversy with Sir John Lawes, carefully discussed in the Bath and West of England 'Journal,' vol. iv. 1856. The mineral manure has long been forgotten; and the principles established by Sir John Lawes are the foundation of modern agriculture.

SALTS.

Carbonates—Phosphates—Sulphates—Nitrates.

I place the word Salt before you prominently. First of all because you are all familiar with common table-salt.

Secondly, because the greater part of the solid matter on the

* See Johnson, 'How Crops Grow,' chapter ii., Ash of Plants, p. 111.
† Ibid. p. 44.

earth is in the neutral condition, to which chemists have applied the word salt. That is, it is neither acid, nor the opposite of acid. Sweetness, like sugar, is not the opposite of any acid. We mix sugar with lemon in punch or lemonade; we mix oil with vinegar in making a salad—but neither of these mixtures alters the nature of the acids. These are mixtures, not compounds.

On the other hand, either lime, or potash, or soda, has a special effect on acids, which is called neutralizing the acid; the result of mixing them with acids was found to be a compound which was called a salt. Common salt was supposed to be a compound of hydrochloric or muriatic acid (the spirits of salt of the shops) and soda. That supposition was found out by Sir Humphry Davy, the immortal founder of agricultural chemistry, as Liebig called him, not to be true. He proved salt to be composed of two single elements, chlorine and sodium. The chlorine has no hydrogen combined with it, and is not an acid; the sodium has no oxygen, and is not a base (or alkali).*

BASES.

I should here call your special attention to the important word "Base." Whenever you hear or read of nitrate of soda, sulphate of ammonia, phosphate of lime, you may assume that the first word ending in "ate" represents the presence of an Acid (generally a strong acid), and that the second word (after "of") implies the presence of the Base combined with that acid, so far as regards the particular compound. Of course it may also be a base combined with other acids in other compounds. Any of you who have read in our Journal about Sir John Lawes's experiments, must be familiar with the expression, "salts of ammonia."

Professor Crum Brown says simply, "when an acid and a base are mixed a salt is produced." He also defines acids and bases as "substances opposed to one another in chemical character, and capable of acting upon one another, so that both the acid and the basic properties are neutralized, and salts produced." †

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* It was usual to speak of the bodies which I have called "opposite of acid," and which, if soluble, have a taste like that of wood-ashes or burnt lime, as alkaline. Ammonia was called *volatile alkali;* potash and soda were called *alkalies* (or *fixed alkalies*); and lime and magnesia were called *alkaline earths.* Stockhardt's 'Agricultural Chemistry,' edited by Henfrey, 1855, p. 21. Brande, chap. vi. p. 594.

† The reader may be specially referred to Professor Crum Brown's 'Elementary Manual' (Chambers' series), section xvii. pp. 16–18, for a simple account of acids, salts, and bases; and for an explanation of the terminations in common use, such as sulphide and sulphate, sulphurous and sulphuric.

The name Salt then, having been adopted, is retained for a number of substances found in nature (such as limestone, or carbonate of lime), which substances have been analysed by science and found to consist of an acid and a base, and for a number of compounds produced by art from the union of acids with bases.

You may take as instances of a natural salt, common limestone or carbonate of lime (if I may be allowed to call carbonic dioxide an acid when dry), or at any rate gypsum or sulphate of lime. As a sample of artificial salts, I might mention a common saline draught. The number of artificial salts is endless; but, if I am not mistaken, they more often result from interchanges between the acids and bases of different salts, than from the simple union of an acid and a base by art.

Superphosphate of lime is a highly artificial salt, but it would require a further knowledge of chemistry to explain it.*

The following may be taken as examples of each of the component parts of salts (acids and bases) with the names of which you are familiar.

ACIDS.

Popular Name.	*Old Scientific Name.*
Oil of Vitriol	Sulphuric Acid.
Aquafortis	Nitric Acid.
Spirits of Salt, or Muriatic Acid ..	Hydrochloric Acid.
Vinegar	Acetic Acid.

BASES.

Popular Name.	*Modern Scientific Name.*
Quicklime	Calcium Oxide.
Potash	Potassium Oxide.
Soda..	Sodium Oxide.
Magnesia..	Magnesium Oxide.

We may speak first of the Bases, as they are the simpler bodies. I have attached to them the modern names; they used to be called oxide of calcium, &c., but I avoid that form for fear the words "oxide of" should be understood like "sulphate of," suggesting the presence of an acid. These bodies are very simple, like common salt, which is now called sodium chloride, showing the union of two simple elements.†

Ammonia, which is a powerful base, is not put into the list because of the special theoretical name, ammonium,‡ which

* The explanation is given fully in Lloyd's 'Lectures,' chap. xi.

† Words ending in "ide," imply the presence of two simple elements in a compound, as words ending in "ate," denote the presence of a compound acid.

‡ The scientific names of metals end in "um," taken from the Latin words, aurum, gold; argentum, silver; ferrum, iron; hence the name ammonium was invented because it is supposed to act like potassium, a metal. Gypsum, though ending in "um," is not a metal.

includes not oxygen, but another dose or equivalent of hydrogen, and will be referred to later.

A beautiful experiment, which can be easily shown by any chemist or druggist, illustrates the oxides of metals.

A red powder known as red precipitate in shops (mercury oxide), when heated over a lamp in a small glass tube (a test tube), can be split up, showing little bright drops of quicksilver, and oxygen gas, causing a red-hot splinter of wood, when placed in it, to burst out into flame.*

This process of separating oxygen from a metal is the same as takes place when iron ore is smelted; it is called "reduction." The union of oxygen with another substance is called "oxidation." When iron rusts, or silver tarnishes, they are oxidized.†

As you are familiar with quicklime, it may be well to note that, if quicklime remains exposed to the air, it gradually becomes slaked, and absorbs carbonic acid and water, so that it partly returns to its former condition of carbonate of lime, partly becomes what is called hydrate of lime by absorbing water. It is also sometimes called hydroxide.‡

Other bases are also oxides of metals, that is, the oxides are compounds of a metal, and of oxygen, and each of them has its fixed proportion by weight to hydrogen as the unit, and to every other substance. But the constitution of the well-known substances caustic soda and caustic potash differs from that of quicklime, by the addition of an element of hydrogen—they are therefore called hydroxides. Such are the following —§

Potassium		Hydrogen		Oxygen		Caustic Potash
39	+	1	+	16	=	56
Sodium		Hydrogen		Oxygen		Caustic Soda
23	+	1	+	16	=	40

These metals, potassium and sodium, have been obtained by very ingenious methods; they are very difficult to obtain in a separate form, and have a tendency (in some cases so intense as to cause a sort of explosion) to return to the compound state by reunion with oxygen. This can be shown by a beautiful experiment with potassium, which takes fire when thrown upon vater.||

* Roscoe's 'Primer,' § xiii., Experiment 30, p. 60. See also p. 108.

† "We have seen that many bases are oxides of metals. We must attend to [the r]elation of metals to their oxides.

[Wh]en a metal or other substance is made to unite with oxygen it is said to [be 'ox]idised'; when the oxygen is taken away from an oxide and the original [su]bstance, whether metal or not, is reproduced, the oxide is said to be reduced." [C]rum Brown, p. 34.

[T]he whole section is very instructive.

‡ 'Calcium Hydroxide.' Fownes and Watts, vol. i. p. 168.

§ Johnson, 'How Crops Grow,' pp. 124-127.

|| [Ro]scoe's 'Primer,' Art. 58, p. 98.

WHAT IS THE USE OF ANALYSIS.

It may occur to you to ask what is the use of all this reduction of compounds to these elements? If these elementary metals are so difficult to present in a separate form, and if they have such a tendency to go back into their former compounds, what is the practical application of this knowledge to Agriculture? I might answer generally, that it is only by an accurate knowledge of the substances we are dealing with, and by learning how they are affected by the circumstances with which we have to deal, such as moisture, heat, chemical affinity, &c., that we can hope to increase our power of cultivating plants and feeding animals with a view to profit. And surely every one must feel the enormous interest involved in the question, What is this thing or that thing made of? especially when we find that a few elements of matter build up all the forms of life and beauty around us.

But perhaps the more immediate purpose now in hand is to enable young students to attach some clear meaning to the modern language of science.

The scientific books now talk of calcium and sodium, and potassium; lime and soda, and potash, with which the farmer is familiar, have dropped out of sight.

Even ammonia is almost superseded now by the name of an imaginary metal, called ammonium, which no one ever saw; but which in all chemical books is now treated like potassium, a metal, in calculation; because some such body seems required by theory to explain the action of ammonia alongside of the other bases or alkalies.

CHEMICAL PRINCIPLES.

So far we have only dealt with one of the component parts of salts—namely, the Bases. Before we go on to the acids it will be well to say a few words about chemical laws or principles.

All the statements I have laid before you (if I except the sentence about ammonium) have been absolutely matters of fact, resting on weight and measure; and not in any way depending on speculation or theory.

I may now ask you to bear with me if I endeavour in a plain way to bring the various figures which I have put before you together, so as to lead up to some principles, and then go on to their application.

These principles, which I here clothe loosely in a popular garb, are given in a precise form further on, p. 288, on competent authority.

Every one of the elements of which I have spoken bears a fixed relation, of number or weight, to hydrogen, which counts as one.

The same figures also express the relation which each element bears to every other element.

No element can enter into combination with any other element unless each element brings to the compound exactly the proportion expressed by the number belonging to it, or the double, or some other multiple.*

Chemical bargains admit of no small change, all the contracts are made in complete sums, that is, not fractions of those sums. If you attempt to combine 20 grains of oxygen with 12 grains of carbon, only 16 can enter into combination, the other 4 will be left out. But, if you try the double of 16, then the 32 grains will combine with the 12, and make a different kind of compound.

The first of these compounds is carbonic oxide, 28 grains. The second, carbonic acid, 44 grains. Still using the old-fashioned names.

But now we had better try to fall in with the new style of scientific language, and call these compounds, just referred to in the last sentence, by their new names:—

Carbon		Oxygen		Carbon monoxide
12	+	16	=	28
Carbon		Oxygen		Carbon dioxide
12	+	32	=	44

No doubt you know that "mon" stands for *one*, single, or alone, and "di" stands for two, or double.

CHEMICAL SYMBOLS.

Now I will ask you to take a further step in Chemical language.

Each of all these elements of which we have been speaking has its symbol, and the symbol is not only a sort of initial for the "proper name," but it also tells us the "combining proportion"—the four first elements of which we spoke are thus expressed:

	Symbol.	Combining Number.
Hydrogen	H	1
Oxygen	O	16
Carbon	C	12
Nitrogen	N	14

* Round numbers only are used in this paper; in modern text-books the numbers are more exactly given in decimals.

Each letter stands both for the name and the number on the same line.

If there is in a compound a double dose, it is expressed thus, H_2; if a triple dose thus, H_3.* So we have—

Water (H H O)	=	H_2O
Carbonic acid or carbon dioxide (C O O)	=	CO_2
Ammonia (N H H H)	=	NH_3

The following are the symbols for the elements with which we are chiefly concerned in Agriculture. They may be arranged under two heads:—

Non-Metals.

Hydrogen ..	H	1
Oxygen ..	O	16
Nitrogen ..	N	14
Carbon ..	C	12
Phosphorus ..	P	31
Sulphur ..	S	32
Chlorine ..	Cl	35·5
Silicon ..	Si	28

Metals.

Calcium ..	Ca	40
Potassium (Kali)	K	39
Sodium (Natron)	Na	23
Magnesium ..	Mg	24
Iron, Ferrum ..	Fe	56

There is in these two lists no attempt to arrange the elements with reference to any chemical theory, they are placed rather in the order of their importance to the farmer.

It may, however, be well to mention at this point that, *besides the combining numbers* given above, there is a classification of these elements which has great importance in modern science. Some elements can only take into union a single dose of any other, though they may themselves be doubled, or trebled. Hydrogen, for instance, as we have seen, is united with oxygen in a double dose to form water, in a triple dose with nitrogen to form ammonia. But hydrogen cannot take into union a double dose of any other element; neither can chlorine. So one dose of hydrogen and one dose of chlorine make what I may call a monogamous (one man one wife) union, and neither can enter into polygamy (or plurality of husband or wife). Oxygen can take two doses; nitrogen can take three doses (or more); carbon can take four doses.

On this basis of fact is built a large structure of most im-

* It may be well to explain to those of my young friends who have learned a little algebra at school, that there is no multiplication between these capital letters. H O does not mean "$(h \times o)$," but $(h+o)$, or rather, H combined with O. H_2 does not mean $(h \times h) = h^2$, nor does H_3 mean $(h \times h^2) = h^3$; we have no squares and cubes. But such a formula as $2(H_2O)$ means *twice* $(H+H+O)$, equal therefore to $(H+H+H+H+O+O)$ or $(4H+2O)$ the number 2 or 3 multiplying a group of letters, separated by a comma from others, which group generally means a compound called a molecule. For the meaning of the word molecule, see below, p. 289.

portant theory, called the doctrine of *quantivalence or valency*—meaning how much is each element worth? as in a limited liability company a careful enquiry into the worth or credit of each new partner may be made before he is allowed to take shares. For the present it may suffice to indicate by four samples the types on which an important classification is set out in chemical books even of an elementary character.

$Cl.H.$	$O.H_2$	$N.H_3$	$C.H_4$
Hydrochloric Acid.	Water.	Ammonia.	Marsh gas, or Fire damp.

These four compounds illustrate the principle of union with one, two, three, or four doses; but in fact nitrogen is capable of taking five doses, and so is phosphorus: so what is here stated is far from a complete account of the principle which, in addition to the names given above, is called the principle of "atomicity."

THREE IMPORTANT ACIDS.

There are two acids which require special notice, because they contain two principal elements of fertility which have to be supplied by the farmer in the Agriculture of the present day.

These two acids are *phosphoric acid* and *nitric acid* (aqua-fortis). A word must also be said about sulphuric acid (oil of vitriol), because, though it is not wanted to supply food for plants (indeed we were told in Sussex that it was poison to them, rather a bygone hobby), it is of much importance in cooking phosphoric manure into superphosphate, and in storing ammonia for use as sulphate of ammonia.

Moreover, all these acids are now changing their names. It will not be necessary to say much about the modern theories which have led to these changes.

Nitric acid in a pure state consists of two doses of nitrogen, and five doses of oxygen, and these are combined with water. As Johnson says, "it is very remarkable that the union of these two gases so harmless (as a mixture) in the air should produce the burning and corrosive compound which this acid is known to be." I may add, it is as remarkable that it should be one main principle in producing our most nutritious food. But in its corrosive state it never reaches plants. It is formed from decaying animal or vegetable matter, and is generally in chemical union with lime, or potash, or soda. Unfortunately, for it is an expensive article, it is very soluble in these forms, and is easily washed out of the soil in rainy seasons.

Phosphoric acid in a pure state consists of two doses of phosphorus with five doses of oxygen, combined with water. This acid also is corrosive. We have to deal with it chiefly in combination with lime, as an essential part of bone, and also of the seeds of plants. It is essential to the early growth of root-crops.

Sulphuric acid consists of one dose of sulphur and three doses of oxygen; but it has an intense thirst for more water, which thirst causes it, in the form of oil of vitriol, to be so burning as to extract the water out of any vegetable or animal substance, leaving it black. Its chief use to the farmer is in dissolving bones or other phosphates.*

It will be noticed that I have mentioned in each case the addition of water; and that each of these acids has a large proportion of oxygen; according to modern theory there is no acid without hydrogen. So what used to be called a dry or anhydrous acid is now called, not an acid, but an anhydride. In Johnston and Cameron's 'Agricultural Chemistry and Geology,' the names are given thus:—†

Old Name.	*New Name.*
Anhydrous or dry sulphuric acid ..	Sulphuric anhydride or trioxide.
Anhydrous nitric acid	Nitric anhydride or dinitric pentoxide.
Anhydrous phosphoric acid	Phosphoric anhydride or diphosphoric pentoxide.

It may not be out of place at this point to notice the fact that there are other acids about which much has been written; such as those called *humic* and *ulmic*, resulting from vegetable

* Another acid ought to be mentioned, *hydrochloric acid.* It is known to the farmer as muriatic acid in muriate of potash. Also it is frequently referred to in elementary books on account of the simplicity of its composition (one dose of hydrogen and one of chlorine) (see above, p. 284). It enters into a number of the simplest experiments, as, for instance, in decomposing lime and causing carbonic acid to escape or effervesce, leaving chloride of calcium.—See Miller, p. 74.

† These acids, in still more advanced modern style, may be often found thus named:—

Sulphuric acid	Hydrogen sulphate.
Nitric acid	Hydrogen nitrate.
Phosphoric acid	Hydrogen phosphate.

See Harcourt and Madan, 'Practical Chemistry.'

Acids are now looked on as salts of hydrogen, and water is called an oxide of hydrogen.

In Jago's 'Text-book' the chapter on water is headed thus:—

"There are two oxides of hydrogen known:

Hydrogen monoxide or water.... H_2O
Hydrogen dioxide or hydroxyll.. $H_2.O_2$."

But these refinements are unnecessary for farmers or their sons who desire only to have some intelligent insight into the composition and practical action of manures and cattle foods, as now explained by science.

matter in the soil. There is a very general impression among farmers and gardeners that substances of this kind, under the general name of humus, constitute valuable food of plants. The subject was much discussed from the time of Sir H. Davy to that of Liebig. What Sir John Lawes has taught us will be shown in another paper. But as there is no special chemical point involved in the nature of these acids, it is needless to dwell on the subject. As a practical question it is probable that lime has a useful effect in turning these acids to good account. The subject is one deserving further experimental investigation. There is much information on the subject of humus in Johnson, 'How Crops Feed,' chap. v. pp. 224–238.

PART II.

ORGANIC CHEMISTRY.

We began with the most complex form of compound—the result of life in animals and vegetables. An endeavour was made to point out in popular language the obvious but characteristic differences of those compounds or parts of the animals and vegetables, and of the sources from which they derive their nourishment. We may now express in chemical terms the difference between the constituents of the fatty matter, and those of the flesh-forming matter. The first (fat, and the foods, starch and sugar) consist exclusively of carbon and the elements of water (not exactly water, but its two elements). The fleshy parts and their food contains in addition to the constituents of fat, also nitrogen, and a small quantity of sulphur and phosphorus.

We have been trying in a very general way to enquire how such compounds as are called salts, and some others, both in vegetables and in the earth, can be, and are, divided into parts, quite opposite in their properties, especially as regards acidity and the opposite of acidity.

We then made acquaintance with compounds of a simpler character, consisting generally of only two elements, and we found that they could be reduced to simpler elements still, some which are metals, and some are called non-metals.

Having thus pulled our old house to pieces and arranged the building materials in certain groups, we may proceed to build up the living *organisms*, as plants and animals are called. All that we have been speaking about hitherto is called *inorganic chemistry*, that is to say, gases, acids, bases, metals merely in quantities and proportions, and compounds.

But plants have roots and stems, and leaves and flowers, and seeds. Animals have limbs, and organs of digestion, circulation and respiration, to say nothing of nerve and brain. And so there is another branch of chemistry most practical, as dealing with all that we eat and drink, with our digestion and various secretions, and also with drugs and medicines, and with many branches of manufactures. This branch of chemistry has long been called, and is still generally called, *Organic Chemistry.*

For a long time it was believed that the compounds discovered (and separately defined) in animals and vegetables could be produced only by living structures. "A large number of organic compounds can now be obtained artificially, without the aid of a living organism. . . . Another definition or additional definition of organic chemistry, or the chemistry of animate nature (the laws of which do not differ from those of inanimate nature), is now generally adopted, namely, the *chemistry of carbon compounds.*" *

GENERAL PRINCIPLES.

Before we state any of the results of organic chemistry which bear on Agriculture, it may be desirable to take notice of two theoretical or speculative doctrines, which may be said to be the keys to all the modern science of chemistry, but the next two or three pages may be passed over by any reader who dislikes or despises theory.

ATOMIC THEORY.

We have dwelt at several points of this paper on the essential principle, or universal fact, that all compounds consist of certain elements in definite proportions both to hydrogen, as the unit, and to one another. The first theory endeavours to account for this fact by the supposition that all the elements are composed of small particles which are so small that they cannot be seen, and which cannot be divided, and yet it is assumed that their relative weight can be known. These particles are called *atoms.* For example, an atom of oxygen is supposed to be sixteen times as heavy as an atom of hydrogen. This is called the Atomic Theory of Dalton (1801).

I subjoin a clear scientific statement of these laws of

* The quotation in the text is taken from 'Chemistry, General, Medical, and Pharmaceutical,' by Professor Atfield, p. 457. I have derived much assistance from the lucid and practical explanations in this book; for the introduction to which I am indebted to Mr. Stocker, Chemist and Druggist, High Street, Exeter. I am sure he would be willing and able to give much assistance to young farmers desirous of learning something practically of chemistry.

chemical combination, taken from an admirable manual of Practical Chemistry, by Mr. Vernon Harcourt, F.R.S., Lee's Reader, Christ Church, Oxford, and Mr. Madan, F.C.S., Science Master, Eton College, 4th Ed., 1887.*

I.—*Law of Constant Proportion.*—A particular compound always consists of the same elements united in the same proportion.

II.—*Law of Multiple Proportion.*—When one body combines with another in more than one proportion, the higher proportions are multiples of the lowest.

III.—*Law of Reciprocal Proportion.*—If two bodies, A and B, combine with a third body, C, they can only combine with each other in proportions which are measures or multiples of the proportions in which they combine with C.

IV.—*Law of Compound Proportion.*—The proportion in which a compound unites with any thing else is the sum or multiple of the sum of the proportions in which its elements are present in it.

The above laws are simply the expression of facts observed in experimental work; they exist quite independently of any speculation as to their cause.

MOLECULAR THEORY.

There is another theory of more recent date, still more important, if true, and more difficult to understand. I have kept it so far carefully out of sight, though in some books which have had great success as text-books for examinations, the most complex problems and the most elaborate scientific phraseology are put forward as infallible truth at the very outset. I can only imagine that such books are committed to memory with little benefit to the learners in an educational sense.

I cannot be presumptuous enough to expound these theories in popular language of my own. I have consulted many books of the highest authority; but, in the absence for many years of practical work in the laboratory, I feel that I have no firm grasp of the subject. I regard with simple amazement the amount of industrious work that has been done during the last y years in our own country and on the Continent.

think that the best course I can now take will be to quote few short statements of principle from elementary works vritten by teachers of acknowledged authority, before I attempt show how the chemical knowledge of the present day bears the production of crops and the feeding of animals.

* ... 'Practical Chemistry,' Appendix B, p. 566.

Professor Crum Brown, of the University of Edinburgh, in his 'Elementary Manual,' says: "When we use the words water, common salt, or potassium sulphate, we do not indicate any particular quantities of those bodies; but when we write H_2O, NaCl, or K_2SO_4, we mean 18 parts of water, 58·5 parts of common salt, or 174 parts of sulphate of potash."

"Just as the quantity of an element represented by its symbol" [one capital letter] "is called its atomic weight, so the quantity of a substance" [or compound of elements] "represented by its formula" [more than one letter, or one letter doubled] "is called its molecular weight."—§ 48, p. 45.

"The Molecular theory supposes that when combination takes place the atoms of the constituents go together to form groups or molecules. . . . The formula of a compound may thus be considered as a list of the number and kind of atoms forming the molecule of the compound."—§ 52, p. 47.

Professor Reynolds, of the University of Dublin, in his 'Experimental Chemistry for Junior Students,' Part I., 4th Ed. 1887, says: "The study of the composition of water has made known the curious fact that a certain volume of oxygen requires twice its volume of hydrogen to form water," and "therefore the two gases unite in a definite proportion by volume as well as by weight."—Chap. V. p. 44.

The same thing is further expressed in the following statement: "One molecule of oxygen unites with two molecules of hydrogen to form the compound water."—p. 49.

A further question is "whether one or more molecules of water arise from their union."—*Ibid.*

Then follows a clear description of an experiment, which leads to the conclusion that "one molecule of water-gas occupies the same volume as one molecule of hydrogen," and that "one molecule of water-gas must have the relative weight 18. . . referred to the hydrogen molecule 2."—p. 53.

The following definitions are added.

"1. *A molecule* of an element or compound is the smallest portion of a body that can exist *in a free state.*

"2. *An atom* of a chemical element * is the smallest portion of it that can take part in *a chemical change*, and is almost always half the *gaseous* molecule."—*Ibid.*

Johnson, on 'How Crops Grow,' p. 48:

"*Molecular weights of compounds.*—While elements unite by *indivisible atoms* to form compounds, the compounds themselves combine with each other, or exist as *Molecules*, or *aggregations of atoms.* It has indeed been customary to speak of *atoms of a*

* "A chemical compound has no atomic weight."—REYNOLDS, *ibid.*

compound body; but this is an absurdity, for the smallest particles of compounds admit of separation into their elements. The term molecule implies capacity for division, just as atom excludes that idea. The molecular weight of a compound is the sum of the weights that compose it.

"The following scheme illustrates the molecular composition of a somewhat complex compound, one of the carbonates of ammonia.

"Ammonia gas results from the union of one atom of nitrogen with three atoms of hydrogen, NH_3. One molecule of ammonia gas unites with a molecule of carbonic acid gas, CO_2, and a molecule of water, H_2O, to produce a molecule of carbonate of ammonia."

Carbonate of Ammonia 1 mol.	Ammonia 1 mol.	Hydrogen	3	= 17 parts	79 parts
		Nitrogen	14		
	Carbonic acid 1 mol.	Carbon	12	= 44 parts	
		Oxygen	32		
	Water 1 mol.	Hydrogen	2	= 18 parts	
		Oxygen	16		

The molecular weight of carbonate of ammonia is therefore 79.

This may be taken to be a fact apart from any theory.

There are several ways of stating the contents of a compound. One is to give the percentage of each element, as, for instance, 100 parts of water may be stated to contain

88·88 per cent. of oxygen.
11·11 per cent. of hydrogen.

This we shall have to employ further on, in the case of several vegetable and animal compounds, the chemical formulæ of which cannot be yet clearly made out.* But we must try to learn the use of formulæ, which really are very helpful both to the understanding and the memory.

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* It will be worth the reader's while, if he has had patience enough to read the last three pages, to read Article 42, pp. 190–198, in Miller's 'Text-book,' on the Atomic Theory and the Molecular Theory, from which the following passage is extracted:—

"The term *molecular volume* is used to signify the space occupied by a molecule of the body in the form of gas or vapour compared with that of the atom of hydrogen, or the *atomic volume* of hydrogen. Now the volume of the *molecule* of a compound body in the aeriform state $\boxed{\;\;\vdots\;\;}$ is exactly double the volume of the *atom* of hydrogen."

See also p. 63 for an illustration of how two atoms of hydrogen united with one atom of oxygen (three atoms) form only two volumes of water:—

$$\boxed{H \mid H} + \boxed{O} = \boxed{H_2O}\,.$$

CHEMICAL FORMULÆ.

There are two kinds of formula for stating the contents of compounds more complex than water. Carbonate of ammonia may be stated to contain, as ascertained by experiment,

		Parts.
1 proportion of	Nitrogen	14
1 „ „	Carbon	12
3 proportions of	Oxygen	48
5 „ „	Hydrogen	5
		79

These several parts and their quantities per cent. being ascertained by analysis to be contained in the compound as a *matter of fact*, this fact is expressed by chemists in what is called an *empirical* formula, NCO_3H_5.

But there is another kind of formula which professes to give the molecules, or inner groups, of the several combinations which enter into the whole—namely, carbon dioxide (carbonic acid), ammonia, and water, thus

Ammonia	Water	Carbonic Acid
NH_3	H_2O	CO_2

"This combination is expressed in what is called a *rational formula*, NH_3, H_2O, CO_2. A substance may have as many rational formulæ as there are rational modes of viewing its constitution."

I state this as it is given in Johnson's 'How Crops Grow,' because it deals in a simple form with elements and compounds of which we have already been speaking. But I apprehend that this mode of statement is not quite in accordance with the present state of theory. In modern books on Practical Chemistry, we find ammonium carbonate $(H_4N)HCO_3$.*

Carbonate of ammonia has been thus dwelt on, not only because it is convenient as an illustration, but because it has a twofold importance for the farmer.

1. It contains the two gases on which plants especially feed.
2. It is present in the gas which so often escapes from ill-managed dung heaps.

Professor Miller's illustration of chemical formulæ and chemical equations (introduced early in his 'Text-book') seems to me especially instructive. He takes a piece of marble, which used to be called carbonate of lime (CO_2 of CaO), now called

* A fuller title is given in Fownes and Watts' 'Inorganic Chemistry,' p. 394. Ammonium and hydrogen carbonate, or Mono-ammonic carbonate $(NH_4)HCO_3$, commonly called Bicarbonate of Ammonia.

calcic carbonate ($CaCO_3$) and by some hydrochloric acid, HCl., and gives the chemical equation as follows:

$$CaCO_3 + 2\,HCl = CaCl_2 + H_2O + CO_2.$$

He points out that the sign = does not indicate "absolute equality" or "identity," but rather is employed in the sense of the word "yields." If certain compounds on the left hand are properly mixed, a chemical change will take place, yielding the compounds on the right hand of the sign =. He explains in words the meaning of the above equation thus:—

"Mix 100 grams of marble with a solution of 75 grams of hydrochloric acid: it will yield 111 grams of calcic chloride." [Chloride of calcium] "18 grams of water, and 44 grams of carbonic anhydride" [carbonic acid].

Calcic Carbonate.	Hydrochloric Acid.		Calcic Chloride.	Water.	Carbonic Anhydride.
$CaCO_3.$	$+2\ HCl.$	=	$CaCl_2.$	$H_2O.$	$CO_2.$

$$\underbrace{\underbrace{40+12+(16\times3)}_{100}\quad\underbrace{2(1+35\cdot5)}_{73}}_{173} = \underbrace{\underbrace{40+(35\cdot5\times2)}_{111}\quad\underbrace{(1\times2)+16}_{18}\quad\underbrace{12+(16\times2)}_{44}}_{173}$$

ORGANIC COMPOUNDS.

We may now proceed to state in a plain way what are the compounds of which plants and animals are made up; and to give some hints as to the changes which take place in these living organisms, as they grow from their birth to maturity, and as they decay till life is extinct; and further, as to the changes which take place in the decayed matter available as plant food or manure.

As I approach this part of my subject, I have just turned to a book which I have over and over again recommended to the readers of this 'Journal,' one of the Handbook series edited by our lamented friend, John Chalmers Morton, 'The Chemistry of the Farm,' by R. Warington, F.R.S., one of the able staff at Rothamsted. If I could hope that my recommendation had been taken by the members of our Society, and Mr. Warington's book duly digested, this paper need not have been written.

On page 2 occurs the following admirable summary:—

"The combustible part of plants is made up of five chemical elements—carbon, oxygen, hydrogen, nitrogen, and sulphur. Carbon generally forms about one-half of the dry combustible matter of plants. Nitrogen seldom exceeds 4 per cent. of the matter, and is generally present in much smaller amount. Sulphur is still smaller in quantity. The remainder is oxygen and hydrogen."

...on, hydrogen, and oxygen form the cellulose,

lignose, pectin, starch, sugar, fat, and vegetable acids which plants contain. The same elements united with nitrogen form the amides and alkaloids, and, further united with sulphur, the still more important albuminoids, which are essential constituents of all plants."

Mr. Warington goes on to name the elements potassium, magnesium, calcium, and iron (the last in very small quantities), as present in all plants. He points out that these metals occur in the plant as salts, combined with phosphoric, nitric, sulphuric, and various vegetable acids, phosphates, sulphates, nitrates, and carbonates.

The two passages which I have quoted verbatim are what we may call clean grit, condensed like Liebig's food. Every word is well weighed, and has a perfectly lucid meaning based on fact.

I may express the humble hope that, in what I have already written, I may have done something to help my young friends to assimilate the food in the first paragraph. In what I have to say further, I shall endeavour to help the reader to digest the contents of the second paragraph, which contains a few rather tough morsels.

It is with great satisfaction that I am reminded of what Mr. Warington says in his preface, that Mr. Johnson's 'How Crops Grow,' and 'How Crops Feed,' are excellent books. I have used them both in what I have already written, and proceed to do so more fully.

We are now to consider what are the organic compounds to be found in plants. Mr. Johnson says they may be conveniently called "proximate elements," a phrase often used in contradistinction to "ultimate elements," which admit of no further subdivision or analysis. I do not think the expression proximate element a convenient one, and shall avoid it. We are dealing essentially with compounds built up or developed out of elements in living structures or organisms, and these compounds are liable to many changes.

TWO CLASSES OF ORGANIC COMPOUNDS.

We may first draw a broad distinction between two classes of compounds, to which we may now give the names by which they are usually distinguished in chemistry, non-nitrogenous and nitrogenous.

The *non-nitrogenous* class is that headed by the letter A in the table in p. 270. *Starch* in the plant, *Fat* in the animal, may be taken as the types of this class.

The *nitrogenous* class is that headed by the letter E in the same table. *Gluten or albumen* in the plant, *flesh* in the animal, may stand as the types of this class.

Each of these classes includes several subdivisions.

It is desirable, however, for agricultural purposes to adopt the usual classification under three heads:—Carbohydrates, Fats and Oils, and Albuminoids. The two first are non-Nitrogenous, the third are Nitrogenous.

CARBOHYDRATES.

In the non-nitrogenous class we may first take the subdivision of which starch is suggested as the special vegetable type. There are several groups under this head. They all agree in this, that they are composed of carbon united to hydrogen and oxygen *in the proportion which forms water;* they are therefore called carbohydrates.

"The bodies of this subdivision form by far the larger share, perhaps seven-eighths, of all the dry matter of vegetables, and most of them are distributed throughout all parts of plants." *

The following may be taken as the principal compounds in this subdivision. *Cellulose* (which is almost identical in composition with *starch*) and *sugar;* of sugar there are two, if not three, kinds, cane-sugar, grape-sugar, and fruit-sugar.

Plants consist of cells visible only with a microscope. By the increase of these cells plants grow. The outer case at least of these cells is composed of a matter (in which there is no nitrogen) which gives to the substance the name cellulose.

"But the most important and, next to water and cellulose, the most abundant ingredient of agricultural plants is *starch.*" † It abounds in wheat, rye, barley, rice, and potatoes. Under great heat it changes into a substance called dextrin, as in the case of baking. Starch also changes under the influence of fermentation, of which malting for brewing is an example. It is not very digestible unless it has been well cooked, or until it has been mixed with saliva; it is unfit for the food of infants before they have teeth, because saliva turns it into sugar, which is more digestible; and this saliva young infants have not in their mouths.

To the stock-feeder starch must always be an important, if not the most important, constituent of the food for cattle, but it has no effect as manure.

The composition of starch and sugar is thus shown by the percentage of carbon, hydrogen, and oxygen:—

Cellulose or Starch.		Cane Sugar.		Grape Sugar.	
Carbon ..	44·44	Carbon ..	42·11	Carbon ..	40·00
Hydrogen ..	6·17	Hydrogen ..	6·43	Hydrogen ..	6·67
Oxygen ..	49·39	Oxygen ..	51·46	Oxygen ..	53·33

* Johnson, p. 55. † Johnson, p 66.

By a neat arithmetical calculation* (which, as this is not an educational paper for schoolboys, might be tedious to our readers), the following formulæ are deduced:—

Starch.	Cane Sugar.	Grape Sugar.
$C_{12}\ H_{20}\ O_{10}$	$C_{12}\ H_{22}\ O_{11}$	$C_{12}\ H_{24}\ O_{12}$
$144 + 20 + 160 = 324$	$144 + 22 + 176 = 342$	$144 + 24 + 192 = 360$

It will be observed that in each case the number of parts or atoms by weight under H and O, in the line below the formula, is in the proportion of 1 to 8, which at the outset we found to be the constitution of water; whereas the small number attached to H is in each case the double of the number attached to O—in accordance with the formula for water, H_2O—showing the number of doses or combining atoms.

Starch changes into sugar, as already noticed, in the mouth; the change being shown by an additional molecule of water. Some such change continually goes on in the plant in many cases, as it ripens and forms sugar. The cellulose of young and succulent stems, leaves, and fruits is digestible to a large extent, especially in the stomachs of animals which feed on herbage, and therefore cellulose ranks among the nutritive substances.† The substances of this group are called *carbo-hydrates*, because they have in their composition either water, or the elements of water in their fixed proportion.

Fats and Oils.

This is a group of organic compounds of especial interest to the farmers. Some oily matters are to be found in nearly all plants; but especially in certain seeds, as hemp, flax, cotton, colza, and olives. Cereal grains, especially oats and maize, contain oil.

All natural fats are mixtures of elementary fats, such as stearine, olein, and margarine, which has attracted so much attention lately. The chemistry of fatty matters appears to be complicated.

Dr. Pavy, in his work on 'Food,' p. 81, speaking of hydro-carbons, or fats, says:—

"These principles constitute compounds of carbon and hydrogen combined with only a small proportion of oxygen. Represented in round numbers, the following may be given as the percentage composition of the chief fatty principles":—

Carbon	79
Hydrogen	11
Oxygen	10

* The principle of this calculation is explained and worked out in Jago's 'Elementary Text-Book,' p. 101.

† Johnson, p. 59.

Dr. Pavy speaks of the class as hydro-carbons in contradistinction to carbo-hydrates. In more recent works the term hydro-carbon is restricted to substances composed only of hydrogen and carbon, such as paraffin, but the difference between the fatty foods and the carbo-hydrates should not be overlooked.

The important point to notice in the fats is the small quantity of oxygen in proportion to hydrogen—10 instead of 88, which would be its proportion in water; therefore the *fatty matters* easily lend themselves to combustion by union with oxygen, and so keep up the warmth of the animal body.

There is a group of bodies called *pectose*, the chemistry of which seems uncertain. They are chiefly to be found in the roots of turnips and beetroots and carrots, also in cabbage. These bodies are also important in the kitchen, as changes in the ripening and keeping qualities of fruits, and also in the cooking of vegetables, are caused by the transformation of this group of compounds. It is not improbable that the ripening of mangel wurzels and the formation of sugar in the store heaps is due to the transformation of these bodies.

There are also a number of *vegetable acids* which chemists have carefully studied, such as malic acid in most common fruits, tartaric acid in the grape.* Some bear on the art of making wine, but they are perhaps more interesting to the druggist than to the farmer.

We must not, however, leave these compounds without reminding the West Country cider-maker that the whole subject of fermentation is deserving of most careful study. Speaking generally, it may be said that, when fermentation is set up, a portion of sugar is decomposed into two molecules, one of alcohol, the other carbon dioxide.

Alcoholic drinks vary much in strength. Cider, and good beer, 4 to 6 per cent. of neat alcohol; good light wines, 10 to 12 per cent.; sherry and port, fortified, 16 to 18 per cent.; proof spirit, 49¼ per cent.; gin, brandy, &c., 35 to 25 degrees below proof.†

ALBUMINOIDS.

We may now pass on to the nitrogenous class of compounds with which the vegetable and animal world are both connected. These bodies belong to the second class, distinguished on p. 270 [illegible], they differ from those to which our attention [illegible] been given because they contain a considerable [illegible] nitrogen.

* [illegible] Johnson, p. 89. † Atfield, p. 521.

Mr. Lloyd, the Lecturer at King's College, in his Lectures, which were highly spoken of two years ago in this Journal, thus opens his account of this class:—

"The nitrogen of plants, so far as it affects their nutritive quality, exists as vegetable albumen, or, more properly speaking, as an albuminous compound. Albuminous compounds were formerly called proteids, and are now generally spoken of as *albuminoids.*"

This last word is one of constant occurrence in scientific writings about Agriculture; and relates to what is of the utmost importance to the farmer, namely, the nutritious character of food. If I may be excused for speaking somewhat loosely, to avoid nice technical distinctions, there is a substantial agreement between the glutinous part of wheat flour, the curd or cheesy part of milk, and the flesh of animals; they are all characterized by the presence of a chemical compound which takes its name from albumen, the white of eggs.

The proportions of the different elements in albumen, and albuminoids do not seem at present to admit of precise definition in a formula. Their percentage composition is said to vary between the following limits:—

Carbon	52·7	to	54·5
Hydrogen	6·9	„	7·3
Nitrogen	15·4	„	16·5
Oxygen	20·9	„	23·5
Sulphur	0·8	„	1·6

The important point to notice is that all these bodies contain about 16 per cent. of nitrogen, which is essential to the formation of flesh.

AMIDES.

There is another word which requires special remark, because it is frequently introduced into writings which treat of the food of animals. The word *amide* occurs frequently in Mr. Warington's admirable 'Handbook,' also in Professor Brown's 'Animal Life,' but I speak feelingly when I say it is rather hard to have a word so technical used without explanation. I have spent I know not how many hours in trying to attach a substantial or practical meaning to this word. The abstract or chemical definition is plain enough.

To go back to old days: Dr. Daubeny, 1850, in his remarkable Introduction to the Atomic theory, thus defines "Amidogen, the name for that hypothetical compound of H_2N which is supposed to produce an amide. An amide is an hypothetical compound consisting of two ingredients, one of which is

constituted of the elements of ammonia with one of its atoms of hydrogen removed."

Stockhardt, 1852, in his 'Experimental Chemistry,' p. 213, says:—

"A compound of one atom of nitrogen with two atoms of hydrogen, NH_2, has been called an amide."

Johnson, 'How Crops Feed,' p. 277:—

"Nearly every organic acid known has one or several amides. . . . Asparagin, a crystalline body formed in asparagus and other plants, is thought to be an amide of malic acid. Also urea, the principal solid ingredient of human urine, is an amide of carbonic acid. . . . Thein, the active principle of tea and coffee, and theobromine that of chocolate, are all regarded as amides."

Since writing the foregoing words, I have received a kind communication from Mr. Lloyd, and also one from Mr. Warington. Perhaps I ought not to have said that the chemical explanation of an amide is plain enough. At any rate I will not venture to retail it to the reader. This, however, may be stated as ascertained fact, that the food which we and the grass-eating animals eat, and which when we eat it contains albumen, becomes altered in the process of digestion, and is voided as urea, a compound of nitrogen, which has not the three atoms of hydrogen required for ammonia but only two, and may therefore be called an amide. Such amides are found in various parts and secretions of the body. This urea by taking up water returns to the state of ammonia in the compound carbonate of ammonia.

The function of the plant is opposite to that of the digestion and excretion of the animal. Ammonia, in the form of nitrates, is supplied to the vegetable, and it gradually builds up, especially in the ripe seed, the nutritious albuminoid. But the plant in building up these albuminoids changes ammonia into amides, which, though imperfect food for animals, are specially adapted for the gradual development of the plant. If the plant be cut before the grain is ripe, before the albumen is fully formed, there will be a large proportion of amides; in the early stages of growth there is but little albumen found.

The grass of a meadow contains a large proportion of amides. In potatoes, swedes, and mangels, from 40 to 50 per cent. of the nitrogen remains unconverted into albumen. In wheat, and seeds generally, and in linseed-cake, and similar compounds, the amount of nitrogen not converted into albumen is generally less than 10 per cent. of the whole.

I hope that in giving some of the substance of the communications which I have received, I have not converted good food

into a mental amide; at any rate my kind correspondents must not be held responsible. But I think enough has been said to show how very important the subject is, and how much we have to learn as to the nutritive value of foods in their different stages of development.

ALBUMINOID RATIO.

There is another term frequently used in scientific books treating of the food of animals, viz., *albuminoid ratio.* It refers to a point of the utmost importance to the breeder and grazier. The term *nutritive ratio* is sometimes used as equivalent to albuminoid ratio.

It is clear that the carbohydrates (starch, &c.), fatty matter, and albuminoids (fleshy matters) should all be present in food. Can we ascertain accurately the proportion which the albuminoids or nitrogenous food should bear to the non-nitrogenous or carbonaceous foods? It has been suggested that young animals should have one-fifth of their food albuminous, that is, that the albuminoid ratio should be as 1 to 4, and in fattening animals much less, say 1 to 6, or 1 to 8. But here again an important point has to be enquired into; how far in giving oily food does the albuminous food act in stimulating the digestive power, and enabling the animal to lay on fat quickly.

Another point should be borne in mind, how much of the albuminous food is retained in the body of the animal? It is calculated, Mr. Lloyd states, that "practically, only one ninth of the nitrogen of the food is retained in the body, the remainder finds its way into the manure."* It is voided not in the solids, but in the liquid urine.

SOIL.

I think it may probably strike some of my practical friends that I have said very little about the soil. When we direct attention to our experiments we are always met by the remark, what suits one soil don't suit another. The remark is very true, no doubt, but not very instructive, unless we know exactly the meaning and reason of each man's experience of his own soil.

Now, I must be frank with the reader. I think we have heard a great deal too much about the chemistry of the soil; or, if not too much, at least much that is not practical.

I believe that a knowledge of the texture of the soil, whether

* Compare what is quoted from late Dr. Voelcker, p. 312 below.

stiff and close, and heavy, or light and gravelly, or sandy, is a matter of more importance than the analysis of its ultimate elements. That is one reason why I have ventured in former papers to call in question what appeared to me a pedantic display of chemical terms; calcium, potassium, magnesium, phosphorus, and sulphur and silica, as leading the practical man off on a wrong scent. I must, however, admit that it may be worth while to ascertain by analysis, in certain cases, whether a soil is deficient in lime, or potash, or phosphates. I have recently had the effect of phosphates in particular cases brought strongly and unexpectedly under my notice; not by analysis, but by the effect on crops.

If I have not entirely failed in my attempt and purpose, I hope I have succeeded in impressing on the practical reader how very small a portion of the plants he grows comes out of the soil, and how much directly, or indirectly, comes out of the atmosphere; let me, at the risk of seeming repetition, restate the case.

Water is composed of two elements, which may be separate gases, or may enter into new compounds, liquid or solid.

One gas (oxygen) enters into combination with carbon, forming carbonic acid (carbon dioxide), and this being inhaled through the leaves forms half at least of the weight of the plant, that is, of the dry matter after the water is evaporated. Another gas (hydrogen) unites with the nitrogen (one part of the air) and forms ammonia, and this nitrogen finds its way (somehow, we will come to that presently) * into the most important vital part of vegetables and animals. Another combustible element, phosphorus, united with oxygen, forms phosphoric acid, and that again is vital to the existence of all seeds, and to the bones and flesh of all animals. As I have admitted, on some soils the need for addition of lime and potash may be proved by long experience, or by modern experiment. But, all this being admitted, the practical man will say, "Do come to the point, how about the soil? do let us have something solid, and no more about gases and artificials." Well, there are two main points to be considered about the soil: one is *cultivation;* the other is *condition.*

As to cultivation.—The object of cultivation may be stated ... above all things to make a good seed bed. That ... sufficient depth of soil into such a condition that the ... may thrive, by being able to send out its roots in ... direction where it can find what it wants, without impedi-

* ... paper on the action of manures.

ment. The soil may be hard, or it may be cold; or clogged with water, or what is called sour; or it may need the admission of the oxygen of the air. One very important point is that in hot weather it should not bake, but be roughened, in order that, by increased radiation of heat, it may be comparatively cool and not parched. All these are matters well known to the good farmer. I believe they require more attention than the chemical constituents of the soil. Another very important element in cultivation is the judicious use in rotation of deep-rooted crops, such as the leguminous plants which bring up dormant nitrogen from below for the use of roots which spread near the surface.

2. Then comes *Condition*. What is condition? Well, condition in the first place may mean the result of a long course of good deep cultivation; but the fuller answer will be given presently in the words of Sir John Lawes. Shortly stated, it is an accumulation, and mixture, of a quantity of vegetable matter with the mineral constituents of the earth derived from the subsoil. This vegetable matter is not ready-made plant food; but a storehouse or reserve of dormant matter, which by good cultivation can be brought into an active state available for the food of the plant.

I do not think that I can offer to my young friends any further assistance by way of introduction to the mysteries of chemical science. I wish I could flatter myself with the hope that they will find, in what I have endeavoured to put into a palatable form, the same keen interest as that which I have felt for some months past in searching the why and the wherefore of good farming practice in the intensely difficult speculations of modern chemistry. But I hope I may persuade some few readers, that there is something worth learning, and that not from books only, but from real practical work at experiments under the guidance of an educated chemist, who either has some practical knowledge of Agriculture, or at least some respect for the experience of those who have such knowledge.

I will now only ask the reader, if he is tired of my "wee bit of simplification," to read carefully what I have extracted from one of the papers of our great and generous benefactor, Sir John Lawes, on the 'Action of Manures,' and from another paper by the late Dr. Voelcker on 'Cattle Food.' That is solid food.

APPENDIX.

ON CHEMICAL WEIGHTS AND MEASURES.

Perhaps I may render some little service to young learners if I give a popular (not an accurate) account of the system of weights and measures now in general use in chemical books. I have long felt myself the inconvenience of not having a tangible equivalent (however rough) always ready at hand for the standards referred to.

The Metrical System.

The system now generally adopted (on account of its great convenience) is based on the French metre.

The metre is $\frac{1}{40,000,000}$ part of the circumference of the earth.

All other *measures of length* are derived from the metre, either by multiplying successively by 10, or dividing successively by 10.

The metre is very nearly 40 inches long—39·37 inches.

Measures of capacity are also derived from the metre. A cubic vessel whose sides are the tenth part of a metre, nearly 4 inches wide and deep, is called a *litre*, which holds a little more than one pint and three-quarters, rather more than the reputed quart of a sherry bottle—1·76 pint.

The metre is divided into a thousand millimetres, commonly printed m.m. in chemical books. Ten millimetres (or $\frac{1}{100}$ of a metre) are called a *centimetre*.

The litre, in like manner, is divided into a thousand little cubes called millilitres, commonly called *cubic centimetres*, or c.c. The side of each of these little cubes is rather more than $\frac{3}{8}$ of an inch, rather less than $\frac{4}{10}$ of an inch. One cubic centimetre, c.c., of distilled water weighs *one gramme*.

The three measures, then, to be kept in mind are the *millimetre*, m.m.; the *cubic centimetre*, c.c.; and the *gramme*.

[In passing, it may be remarked that all travellers on the Continent are familiar with the kilometre, a thousand metres, about $\frac{6}{10}$ of a mile, or 1093 yards; and the kilogramme, a thousand grammes, about two pounds and two-tenths—both [illegible]oken o[illegible] as the kilo[illegible]

[illegible] *Imperial System.*

[illegible] weights also depend on the weight of [illegible]ain measure [illegible] distilled water, at the sea-level in London [illegible] Fahrenheit and 30 inches on the Barometer.

The measures depend on inches marked on a pendulum swinging seconds * at the same place and temperature. The measure of water is a gallon, measuring 277·274 cubic inches; the weight is fixed at 10 lbs., or 70,000 grains.

It is well to remember that there is a point at which the French and English measures can be compared without fractions, or rather with so very small a fraction that it may be left out of account for most purposes.

$$\left.\begin{array}{c}\text{100 Litres,}\\ \text{or}\\ \text{100,000 grammes,}\end{array}\right\} = \left\{\begin{array}{c}\text{22 Gallons,}\\ \text{or}\\ \text{1,540,000 grains.}\end{array}\right.$$

Divide both sides by 100,000, or strike off five figures.

1 gramme = 15·4 grains.

The merit of the metrical system is that the cubic centimetre, or the thousandth part of a litre, is the simple unit of weight, namely, 1 gramme.

One great inconvenience of the English system, especially for scientific use, is that the smallest solid unit and fluid unit do not agree.

The solid ounce is divided into 437·5 grains. The fluid ounce is divided into 480·0 minims. Consequently, as Mr. Squire points out in his 'Companion to the Pharmacopœia,' the minim of fluid is not of the same capacity as what he calls the grain-measure.

The minim = ·91 parts of a grain of water.

Instead of going into details and long tables of decimals, which can be found in any good modern book on arithmetic, it may be more to the purpose to set down a few practical equivalents for the figures in chemical books. The terms decilitre, centilitre, millilitre, are not much used.

Half a litre is usually called	500	c.c.
Three quarters „ „	750	c.c.
An English pint, 20 fluid ounces	567	c.c.
One fluid ounce	28	c.c.
One drachm, 60 minims	3·55	c.c.
One English cubic inch	16·88	c.c.

It is important to note, as already said, that one gramme (the basis of all weights) of distilled water is one c.c.

There is also a little weight, invented by Dr. Hoffmann, the great promoter in England of modern chemistry. It is the weight of a litre of hydrogen gas, which is 0·0896, less than $\frac{9}{100}$ of a gramme. This is now adopted as the unit of gas calculations.

* It is curious that the length of this pendulum differs by a small fraction from a French metre, 39·13, as compared with 39·37.

It is called a crith, from a Greek word for a barleycorn. Dr. Hoffmann told his pupils to inscribe this figure as with a sharp graving tool on their memories. Again, he says, "Do not lose this figure 0·0896; have it ready at a moment's notice."

Measures of Temperature and Atmospheric Pressure.

Thermometer.

In modern chemical works the scale of the ordinary English Thermometer (Fahrenheit) is rarely used. That scale begins at 32 degrees below the freezing point, and rises to 212 degrees for the boiling point. The interval between the freezing point and the boiling point is divided into 180 degrees.

On the scale almost always used in chemical books the interval between the freezing point and the boiling point is divided into 100 degrees (beginning at zero freezing and rising to 100 degrees boiling). This scale is called the Centigrade scale.

It follows that 5 degrees on any part of the Centigrade scale are equal to 9 degrees on the Fahrenheit scale. But, as the scales do not start from the same point, the 32 degrees below the freezing point have to be added to the corresponding degrees on the Fahrenheit scale, counted from the freezing point upwards.

Thus 15 degrees (3×5) Centigrade correspond to 27 degrees (3×9) Fahrenheit above the freezing point (0 Centigrade), to which must be added 32 degrees, or

$$15^\circ \text{ C.} = 27 \text{ F.} + 32 \text{ F.} = 59 \text{ F.}$$

Two points often referred to on the English scale are represented thus:—

60 Fahr. = 15·5 Centig.
62 Fahr. = 16·6 Centig.

Another point of special interest is the temperature at which water weighs heaviest, or the point of the "maximum density" of water—

4° Centig. = 39·2 Fahr., or $7\frac{1}{5}$ degrees above Freezing.

Barometer.

The height of the Barometer is also usually expressed by the fractions of a metre, not by inches: 30 inches, as already explained, are a little more than $\frac{3}{4}$ of a metre. So on the Barometer

0·76, or 760 m.m., corresponds nearly with 30 inches (accurately 29·92).

XXIII.—*Some Explanation of the Action of Manures, derived chiefly from an Article written by Sir John B. Lawes for the Newcastle Farmers' Club.* By Sir T. D. ACLAND.

THE following Paper is an attempt to convey to the practical farmer in the South some of the valuable lessons taught by Sir John Lawes some years ago to a body of North Countrymen, whose climate has some points in common with the hill country of the West. It was the desire to carry out this intention which led to the preparation of another Paper dealing with chemical words and symbols. Sir John Lawes, it is hoped, will pardon the liberties taken with his valuable lecture.

Sir John Lawes begins his Paper by a striking application to Agriculture of the great contest, so forcibly illustrated by our celebrated countryman, Darwin, which has been carried on in the animal and vegetable kingdoms:—

"Endless trials, endless failures, carried on generation after generation, have resulted in a system which may be defined as the 'survivor of the fittest.'

"This does not in any way imply that changes or improvements are not to be made, but only that, while other systems have failed, the system in general use has stood its ground, and so has become the survivor in the struggle for existence."

The object of the Paper is to "offer some explanation of the practices now in use, and to give scientific reasons for the processes carried on every day in the operations with which farmers have been familiar for a generation."—P. 6. Sir John Lawes proceeds with great modesty to say that he cannot hope to increase in the smallest degree the profits of any one who reads his remarks; he only hopes to throw some light on the reason of operations daily carried on in practice. One main point of his remarks is to draw attention to the dormant and active forms of nitrogen, and especially to the action of nitric acid.

"Nitrogen exists in soils in three combinations: 1, with carbon; 2, with hydrogen; 3, with oxygen. When in combination with carbon, it is almost, if not quite, as insoluble as phosphoric acid."—P. 10.

And it is in this insoluble form that by far the greater part of nitrogen exists in soils. It is derived partly from vegetation which existed long ago, partly from vegetation recently "grown upon the land," under which head I understand farmyard dung to be included; but the whole of the nitrogen is not in that form.

"Nitrogen in combination with hydrogen" (as we have seen

in another paper) "forms ammonia. Ammonia cannot exist, as such, for any length of time in the soil, as it is rapidly converted into nitric acid."—P. 10.

There is a minute action going on underground which tends to separate the nitrogen from the hydrogen and the carbon, and to unite it (the nitrogen) with oxygen. It thus forms nitric acid. "But to effect this, lime must be present in the soil, and the compound so formed is called nitrate of lime."

The following passage from Mr. Warington's 'Chemistry of the Farm,' further explains the underground process, the explanation of which is due to his special investigation.

"A large part of the elements of plant food contained in soils is present in such a condition that the plants are unable to make use of it. A soil may contain many thousand pounds of phosphoric acid or of nitrogen, and yet be in a poor condition; while a small portion of readily available food, as superphosphate or nitrate of sodium [nitrate of soda], may greatly increase the fertility.

"The nitrogen contained in humus is not in a condition to serve as a general plant food; cereal crops are apparently unable to appropriate it; leguminous crops, however, possibly assimilate some humic matters. By the action of a minute bacterium present in all soils, humus and ammonia are oxidised, and thus nitrogen is converted into nitric acid. Nitrification only takes place in moist soil sufficiently porous to admit air. It is also necessary that some base should be present with which the nitric acid may combine; this condition is usually fulfilled by the presence of carbonate of calcium [ordinary lime.] Nitrification is most active at summer temperatures; it ceases apparently at the freezing-point."

"Salts of nitric acid, a familiar example of which is nitrate of soda, are not only very soluble in water, but they form no insoluble compounds with the soil." . . . they are therefore easily washed out . . . "living vegetation being alone capable of arresting the escape of nitric acid." It has been shown that a high temperature conduces to the rapid formation of nitric acid, and dry weather tends to prevent it from being washed out before the crops can take it up.

Turnips—Action of Phosphoric Acid.

It is unnecessary to remind our readers of the principle established by Sir J. Lawes, that nitrogen is of paramount importance for the corn crops; and that phosphates are required for roots. [illegible] in the paper from which I am quoting, he explains the

action of both manures with reference to each crop. As regards turnips, they "are sown at a period of the year when the moisture of the soil is at a minimum, and the temperature at a maximum." The seed has at first to live entirely on itself; "compare its size with that of a bean or pea, or even with a grain of corn, and it will be seen at once how helpless, almost hopeless, is its condition. During this early period it sends down some roots into the soil, and produces a leaf or two above ground; but with so minute a seed the growth of the turnip must be limited, and the first appearance of a leaf often renders it a prey to the fly.

"By the time the store of food in the seed is exhausted, no further growth can take place; and unless the root comes in contact with phosphate, it perishes."—P. 8.

But "it would be a great mistake to suppose that because turnips are grown without a direct supply of nitrogen in manures, they are less dependent upon a supply of this substance [nitrogen] than corn crops."

WHEAT—ACTION OF NITROGEN.

Sir J. Lawes gives some very important calculations based on the Rothamsted experiments. He has found that at the end of forty years' growth of successive corn crops enough nitric acid has been liberated from the soil, together with what can be obtained from the air, to grow thirteen bushels of wheat per acre; "that we may supply potash, phosphate, or any other manures—provided that they contain no nitrogen; but it is all in vain, they can produce little or no increase in the crop."—P. 13.

But without any change except the addition of "a sufficient quantity of nitrate of soda, or nitrate of lime would be equally effective, he can grow a crop of from 30 to 40 bushels of wheat per acre every year." His calculation is that he can thus increase the produce from 10 bushels of corn and 1000 lbs. of straw, to 20 bushels and 2000 lbs. of straw, or to 30 bushels and 3000 lbs. of straw, according to the amount of nitrate. The total produce carted off being respectively 1600 lbs., 3200 lbs., 4800 lbs.

He says it will be sufficiently accurate "to say that only 6 lbs. of every 100 lbs. are furnished by the soil, while 94 lbs. are furnished by the atmosphere; and of the 6 lbs. furnished by the soil, 5 lbs. consist of minerals, and 1 lb. of nitrogen."—P. 13.

But calling attention to the seasons, he warns us "that in favourable seasons there will be abundance of grain, and in unfavourable seasons very little."—P. 14.

What is Condition?

That is another very important matter in Sir John Lawes's Paper. How is the nitrogen put into the soil to be made available without waste?

This enables us to get an answer to a question to which very hazy answers are often given by valuers and others. What do we mean by "condition"? Sir J. Lawes "deals with a certain class of compounds of carbon with nitrogen . . . . as it is these compounds which constitute what is commonly called 'condition.'" He says: "When purchased foods are consumed upon the farm, but a small portion of the nitrogen they contain is carried off in the increase of the animal; the larger moiety is found in the urine, though two very important parts exist in the solid excrement, one in the form of undigested food, and the other in the indigestible portion of the food."—P. 16.

"The distinction between nitrate or salts of ammonia and cattle foods—that is to say, between nitrogen in combination with oxygen or hydrogen" [nitrate or ammonia] "and nitrogen in combination with carbon" [cattle food, say cake]—is this, "that in the former the nitrogen is at once available as food for plants, in the other only a portion of the nitrogen is in an active state, while other portions become slowly available after considerable portions of time.

"Nitrates frequently produce overgrowth, more especially in cold or wet seasons, merely from the fact that they are applied all at once, and in consequence are liable to be taken up rapidly by the plant."—P. 18.

Two Objects of Manure.

It seems to follow from these statements that the farmer should, in the application of manure, carefully consider the different objects to be aimed at, and the different kinds of food to be supplied according to the object in view. Is the object to put into the ground what is called a lasting manure, which will supply the wants of all the crops in a rotation of four or more years? or is the object to put into the ground merely what l probably produce a large increase during *the current year* *avourable season?*

t seems clear that for immediate return there must be a considerable amount of nitrogen, whether for roots or for grain, and this in a form immediately available. It seems almost ...ain that in wet seasons much of this nitrogen, if ready, will ...ed and that in a cold season there will be but a slow

conversion of the required food from a dormant to an active and available state; but it is not clear that if the nitrates are not immediately available in the first year, they will be available or forthcoming afterwards.

"It frequently happens that the amount of nitric acid liberated from a soil is not sufficient to grow as large a crop of corn as the cultivator desires; he therefore goes into the market to purchase more. Here I may mention that the nitric acid liberated in an ordinary soil is generally in combination with lime, while in the purchased salt it is combined with soda; but the nitrogen, *which is the active element*, is exactly the same in both compounds.

"It will, I fear, be yet some time before practical farmers will clearly recognise this fact. I have reason to think that they look upon nitrate of soda as bearing the same relation to the ordinary manure of the farm, as mustard and pickles do to beef.

"Farmers as a rule describe nitrate of soda as a stimulant . . . perhaps they might give it a worse name than this if the application were followed by a cold, wet summer, and they found that their corn was overgrown and laid."—P. 12.

Unexhausted Fertility.

Sir J. Lawes gives some important information as to the residue of previous manuring on an experimental barley field with heavy doses of dung and of rape-cake, which had gone on for twenty years. For eleven years afterwards the land received no manure. He calls special attention to the fact that the power of the barley to take food from the soil extends over a period of not much more than three months: so that during an autumn and winter there was no vegetation to take up nitric acid, or to evaporate water from the soil; this last is an important point not thought enough about. The land which, as already stated, had, after receiving dung for twenty years, been unmanured for eleven years, gave a crop of 36 bushels per acre, and in Sir John Lawes's opinion might go on for twenty or thirty years yielding an increase, due to the unexhausted residue of the original application.

He then says, "It is true that in farming operations dung is supplied in very much smaller amounts, but the principle must be the same. Carbon, *which is only another word for vegetable matter alive or dead*, appears to be the only medium by which nitrogen is accumulated in the soil to be again used by living vegetation."—P. 22. Here then we have the answer to the question, What is "condition"?

There remains another question. At what cost is condition to be obtained, and maintained? It is at least a looking up of capital.

"Condition is always accompanied by an increase of carbon in the soil."

"I must point out, however, that *it is not from the carbon being of any value as a manure*, but from the fact of its being the conserver of the store of nitrogen which is liberated at all times of the year, but more especially at the time when vegetation is most active and requires it the most.

"It is the rapidity with which an application of nitrate acts, and the overgrowth which often follows in consequence, that has caused its being looked upon as a stimulant, rather than an important element of plant food."—P. 26.

Potash.

Sir John Lawes says only a few words about one important element of growth—potash. "It is far more largely distributed through soils than phosphoric acid, and when grain and animal products are the only articles sold off the farm, the crops generally find all they require in the land, but it is quite otherwise when roots are grown for sale." He says that when potatoes or roots are grown for sale the cultivator generally has access to town manures which furnish enough potash, but if such manure is not available, potash in some artificial form will be needed.

Our readers will not forget the information given with respect to the effect of potash on chalk soils in Norfolk and elsewhere, in former numbers of this Journal.

Pastures.

Sir J. Lawes closes his lecture by a short reference to the importance of "pastures and layers, which are green all the year round, as the great conservers of manure," as already pointed out, "on a bare soil—that is to say, a soil without vegetation to arrest the escaping nitric acid; but also (vegetation being the chief agent for the evaporation of water) on the bare soil there will be the largest amount of drainage."

This reference to pastures is interesting to West of England farmers. Among other considerations, it serves to explain the practice of "grassing out," as it is called, for two or three years, sometimes five or six years, in a rotation; it shows the wisdom of spreading dung on clovers in the autumn. The tendency of [illegible] escape by the drains shows how very important it

is to secure every drop of drain-water that can be carried over our water meadows or any grass land.

SUMMARY OF LESSONS.

I have thus endeavoured to gather from Sir John Lawes's lecture some of its substance. There is much besides on the question of unexhausted fertility which rather concerns outgoing tenants than what are called sitting tenants, and touches on some points more or less open to dispute.

I will try to put into few words the lessons which I think practical men may learn, if only in the way of explaining their own practice:—

1. That nitrogen is the most important element in the food of plants, especially for corn, but also for roots.
2. That phosphoric acid is chiefly important for young plants sown in spring or summer which have not time to forage for themselves underground in autumn and winter.
3. That ammonia is changed into nitric acid, and that nitric acid has to be neutralized by lime or other base before the plant can feed on it.
4. That in this state of a neutral and soluble salt nitrogen is very liable to be washed out, especially during a rainy season.
5. That an accumulation of vegetable matter underground is an important storehouse for nitrogen, and for condition acting gradually.
6. That nitrates are not stimulants, but food for plants. That ready-made vegetable matter underground is not food for plants till it has been decomposed.
7. That probably lime acts not only in the correction of acids, but also in developing the dormant nitrogen.
8. That while it is of the utmost importance to stir and open soils (when they do not specially require compression) in order to admit the action of the air, the long continuance of bare soil without growing vegetation in cold or wet weather causes great waste of nitrates.

Having thus done my best to call attention to the lessons taught at Rothamsted, I hope I shall not be deemed presumptuous if I say that it is not clear to me that on the thin poor soils near the rock on our hill tops there is any great store of nitrogen to be developed. Certainly we have special need to guard against the waste of nitrogen in our wet climate.

But in the present volume will be found some remarkable evidence of the effect of phosphate on the oat crop, both on thin shallow soils near Exmoor, and also on cold washed-out

clays, between Dartmoor and the Bristol Channel. Further west, in Cornwall, good farmers find no manure equal to dissolved bones, whether the value be nitric or phosphoric.

XXIV.—*On Food for Grazing, and for the Dairy; chiefly derived from a paper by the late Dr. Voelcker.* By Sir T. D. Acland.

An attempt will be made in the following pages to give a practical application to the feeding of animals of what has been written on chemistry. The scientific terms in common use may here be used without further explanation.

There are two questions on which science can help us to judge of the nourishing value of the different kinds of food:—

1. What is there in the food?
2. How much of it can the animals digest?

I cannot better serve my farming friends than by advising them to purchase one of Morton's handbooks, by Mr. Warington,* and to follow Professor Brown's advice (given in another of those handbooks, 'Animal Life on the Farm') by carefully studying chapters v., vi., and vii. of that book; treating of "foods," their "relation to the requirements of the animal," and "to the manure produced." But with Mr. Warington's book before me as a guide, and in the hope that many of my readers will have it too, I will now draw instruction from an excellent paper on the "Theoretical and Practical Value of Purchased Food, and of its Residue as Manure," by the late Dr. Voelcker, published in the 'Royal Agricultural Society's Journal,' vol. xii. 1876. Though I may not be able to mark many entire sentences with inverted commas, as not being copied *verbatim*, the substance of what follows is derived from that paper.

It has already been pointed out that the solid matters in food may be classed under three heads:—

1. Carbo-hydrates (starch, sugar) and fibre.
2. Ready-made fat.
3. Albuminoids (and amides).

1. *The carbo-hydrates* alone could not possibly support life long, nor would the fat avail without some nitrogenous matter in a digestible form. A certain quantity of this kind of food

* 'Chemistry of the Farm.' The 4th edition of this book is revised and much enlarged, 1886; Bradbury and Evans. Price 2s. 6d.

is essential (for farm animals) to maintain the warmth of the body. About half the carbon in the food is consumed by oxidation (that is, union with the oxygen in the air) through the process of respiration. One consequence of this is that slow feeding for the butcher involves a certain loss of food wasted in breathing and keeping alive, but adding nothing to the weight of meat sold.*

"When food rich in starch or sugar is given in larger quantities than is required to support respiration, and to generate animal heat, the excess of the carbo-hydrates is converted into fat, and stored up in the body, provided there be sufficient nitrogenous matter present."

"Cellulose or woody fibre does the same work, *as far as it is digested*, as the starch or sugar."

"The tender cellulose fibre of unripe straw or of hay is certainly assimilated .... to a limited extent .... by herbivorous animals, whilst the hard woody fibre of over-ripe grass or straw is digested less perfectly, and ejected in larger proportions in the dung."

2. *Ready-made fats and oil* are the most expensive, but also the most valuable of all food constituents; they are readily taken up by healthy animals with a certain amount of change.

"The proportion of carbon in fat amounts to about 80 per cent., which is much more than there is in starch or sugar. In round numbers, one part by weight of fat or oil is as valuable a feeding material as two-and-a-half times as much sugar or starch. But besides this direct value as food, fat serves important functions in the processes of digestion and nutrition." Fat certainly possesses high digestive powers.

I remember, speaking here for myself, that I found out forty years ago the digestive value of 1 lb. of oilcake per day given to what were called straw bullocks in the winter at Cloutisham farm, under Dunkerry beacon, and some of my friends in the hills will, I am sure, say that they have found it lately to be true.

Fat thus takes an active part both in the healthy growth of young stock, and in the processes by which other nutritive constituents are converted into butcher's meat.

3. *Nitrogenous substances* in the state of albumen, or albuminoids, are a most valuable class of organic compounds. "They contain about 16 per cent. of nitrogen and small quantities of sulphur or phosphorus, or both, in organic combination: they are absolutely necessary for the formation of the substance of lean flesh.

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* See a note to Mr. Stevens's paper on "Winter Feeding," p. 186.

"Peas, beans, and all leguminous seeds, linseed-, rape-, cotton-, and other oilcakes, are rich in flesh-forming matters or albuminoids. Most cereal grains also contain considerable proportions of such compounds; whilst roots, green produce, straw, chaff, and similar bulky feeding materials, are, comparatively speaking, poor in albuminoids."

Mr. Warington says "the leguminous seeds, as beans, peas, and lentils, are rich in albuminoids, but not in fat. The cereal grains are much poorer in albuminoids, containing only about one-half the proportion found in leguminous seeds." "Of the common cereals, oats are generally the most nitrogenous, and maize the least. Oats and maize are characterized by containing more fat than the other cereal grains; the special characteristic of other cereal grains is their richness in an easily digested carbo-hydrate—starch." *

It is, however, necessary at this point to utter a word of warning about the scientific analyses of food. It is not enough to know by analysis the elements or even the compounds of which foods consist, unless careful attention is given to the digestible qualities of each constituent.†

It was at one time supposed that increase of weight of meat depended on the increase of the nitrogenous foods. This is a matter to be determined by experience. Careful feeding experiments appear to have proved that the *amount* of nitrogen in the food, whether grass, or grain, or roots, is not the best test of feeding quality. One main point to be considered is *digestibility*.

"The *proportion*, however, of the nitrogen to the other constituents is the most important test of value. When nitrogen or albuminous food is present in too large a quantity, the animal wastes it to get at the non-nitrogenous heat-forming food it requires; and when not enough nitrogenous food is present, he wastes the heat-formers to get at the flesh-formers."

For this explanation I am indebted to Mr. Lloyd, a pupil of Dr. Voelcker's.

Before we refer further to what Mr. Lloyd has to say on this subject, the following extract from Dr. Voelcker on manurial value of food deserves attention :—

"The *manurial value of food* depends mainly on the amount ..., nitrogenous matter; 2nd, potash; 3rd, phosphoric

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*. 84, 4th ed.

† It has been shown during the last few years that a part of the nitrogen of vegetable foods exists not as albuminoids, but as amides" (asparagine, &c.), "and in some cases as nitrates." (This applies specially to bran grains and malt dust rich in nitrogen, but not all digestible.)

In the case of hay, straw, green-fodder silage, the general composition is a less safe guide to the nourishing value."—Warington, p. 82.

acid, which passes through the body into the dung of the animals—practically the whole of the potash and phosphoric acid pass into the dung." The loss of nitrogen which the food sustains in passing through the animal has been estimated variously at from one-tenth to one-sixteenth.

"On the whole, no great mistake will be made if it be assumed that 90 per cent. of the total amount of nitrogen in such concentrated food as oilcake, when given to fattening stock, is recovered in the solid and liquid excrements, presuming that these are collected without loss."

It is further observed that for a given amount of increase produced oxen void more as manure, and expend more in respiration, &c., than sheep; and sheep very much more than pigs.

Digestibility.

To return to the question of digestibility, Mr. Lloyd has recently delivered one or two lectures, in which the result of researches recently carried on in Germany is given. He has drawn up some full tables on the subject, from which a few samples may be taken by way of illustration. It must first be noticed that the water in each kind of food is omitted—the dry food is what we have to do with.

	Percentage Composition.				Percentage Digestible.		
	Dry Matter.	Albuminoids.	Carbo-Hydrates	Fat.	Albuminoids.	Carbo-Hydrates.	Fat.
Barley Meal	83·5	10·0	63·9	2·5	8·0	58·9	1·7
Oats	85·7	12·0	55·7	6·0	..	..	..
Bean Meal	82·4	25·5	45·9	1·6	23·0	50·2	1·4
Maize	87·0	10·6	69·7	5·5	9·1	67·1	4·2
Linseed-Cake	79·0	29·5	29·9	9·9	24·8	27·5	8·9
Cotton-Cake, Decorticated	81·2	38·8	19·5	13·7	31·0	18·3	12·3
Swedes	12·0	1·3	9·5	0·1	1·3	10·6	0·1
Turnips	7·3	1·1	5·3	0·1	1·1	6·1	0·1
Cabbages	13·7	2·5	8·1	0·7	1·8	8·2	0·4
Hay (Meadow)	79·5	9·7	41·4	2·5	5·4	41·0	1·0
Straw, Barley	81·6	3·5	36·7	1·4	1·3	40·6	0·5
Straw, Oat	81·7	4·0	36·2	2·0	1·4	40·1	0·7
Straw, Wheat	81·1	3·0	36·9	1·2	0·8	35·6	0·4

The first column in the above Table shows the amount of available solid food or dry matter in each kind of food. The next three columns show what the chemist finds in each food by analysis. The last three columns show what the

animal finds. It is a case of "the proof of the pudding." Though in this case the proof is not exactly what the grazier might wish to find in the sale of the beast; the proof is found by a careful analysis of what the animal has ejected as excrement. I confess I should rather like to see the proof of the live weight on the weighbridge, or the dead weight on the scales of the butcher also. But in fact there are valuable materials in the records of experiments at Rothamsted to which I am unable at present to refer.

Mr. Lloyd has also directed attention to another practical point in a lecture on the Economy of Feeding—namely, the careful attention to what he calls a proper *ration*—he refers to a case of a dairy where the cows were costing 10*s.* 6*d.* a week in the winter. The food was given in too great quantity, and it was not of the quality suitable to a dairy cow. The food was changed, less was given, but of the right sort. The milk came more abundantly and of better quality, and the cost was reduced by 4*s.* a week. Such is the statement. I do not give the astonishing total per cow for the year, because it is not to be taken for granted that the saving on winter food would be effected all the year round.

Mr. Lloyd states "that feeding experiments have been conducted, those in Germany with greater care than anywhere else, and a brief sketch of the results is given" in the Table on page 317.

Food for Dairy Cows.

In a lecture delivered by Mr. Lloyd,* as Chemist of the Dairy Association, on the value of fat as a constituent of the fat of animals, he states :—

"Physiologists have been driven to the conclusion that the fat present in the food does not go direct to form fat in the animal body, but is broken up, and the fat of the animal formed anew." Into the scientific considerations on which this conclusion rests we need not enter here.

But the practical importance of the question, both to the dairy farmer and to the fattener of live-stock, is immense.

Does ready-made oil directly increase the butter or the fat of the animal? Or is it the most economical form of food for either of those purposes?

It is a well-known property of bean-meal, pea-meal, and decorticated cake (and I believe I may add of bran) to increase the flow of milk and the richness of milk in butter.

Here, then, we probably have another proof that Science is

* 'Journal of British Dairy Farmers' Association,' vol. iv. part 1, 1888.

helping us to interpret practice, and in consequence to make practice more economical, more profitable, and more truly practical.

Animal.	Live Weight.	Food required per Day.				
		Dry Matter.	Digestible.			Nutritive Ratio.
			Albu-minoids.	Carbo-Hydrates.	Fat.	
Oxen, Growing—	Lbs.					
Age, 6–12 months	500	12·0	1·3	6·8	0·30	1–6·0
„ 12–18 „	700	16·8	1·4	9·1	0·28	1–7·0
„ 18–24 „	850	20·4	1·4	10·3	0·26	1–8·0
Oxen, Fattening .. .. per	1000					
1st period	..	27·0	2·5	15·0	0·50	1–6·5
2nd period	..	26·0	3·0	14·8	0·70	1–5·5
3rd period	..	25·0	2·7	14·8	0·60	1–6·0
Cow in Milk .. .. per	1000	24·0	2·5	12·5	0·40	1–5·4
Sheep, Growing—						
Age, 5–8 months	61	1·7	0·17	0·86	0·04	1–5·5
„ 8–11 „	75	1·7	0·16	0·85	0·04	1–6·0
„ 11–15 „	82	1·8	0·14	0·89	0·03	1–7·0
Sheep, Fattening .. .. per	1000					
1st period	..	26·0	3·0	15·2	0·5	1–5·5
2nd period	..	25·0	3·5	14·4	0·6	1–4·5
Horses at Work .. .. per	1000	22·5	1·8	1·12	0·60	1–7·0
Pigs, Growing—						
Age, 3–5 months	100	3·4	0·50	2·50		1–5·0
„ 5–8 „	170	4·6	0·58	3·47		1–6·1
„ 8–12 „	250	5·2	0·62	4·05		1–6·5
Pigs, Fattening .. .. per	1000					
1st period	..	36·0	5·0	27·5		1–5·5
2nd period	..	31·0	4·0	24·0		1–6·0
3rd period	..	23·5	2·7	17·5		1–6·5

Mr. Lloyd delivered on March 1st in the Dairy School at Exeter a most useful lecture on "Cattle Food in Relation to the Dairy," before a large audience. The lecture will probably be printed separately. Members of the Society may apply to the Secretary, Bath; or to the publisher, Mr. Eland, High Street, Exeter.

The Note-Book.

1.—*Results of Experiments at Rothamsted, on the Growth of Root-crops for many Years in Succession on the same Land.* A Sequel to a Lecture delivered at Cirencester Agricultural College, July 27th, 1887, by Dr. J. H. GILBERT, F.R.S., Hon. Professor of the College.

1. LIKE sugar-beet grown for sugar, roots grown for feeding purposes are very artificial productions. The swollen root consists of a very abnormal development of the reserve material for the second growth of stem and seed; and the conditions of growth, as to the period of the season selected, the soil, and the manuring, are such as to obtain the maximum development within the season.

2. Roots, as grown in our rotations, are generally considered to be restorative crops. But they depend for their successful development on large quantities of manure; which is sometimes applied for the previous grain crop, but more frequently directly for the roots themselves; and when grown without manure, even from the same seed as the manured crop, either for a few years in succession on the same land, or even in rotation, they soon revert to the uncultivated condition.

3. Independently of the great advantage arising from the opportunity which the growth of roots affords for the cleaning of the land, the benefits of growing the crops in rotation are due—to the large amount of manure applied for its growth, to the large residue of the manure left in the soil for future crops, to the large amount of matter at once returned as manure again in the leaves, to the large amount of food produced, and to the small amount of the most important manurial constituents of the roots which is retained by the animals consuming them, the rest returning as manure again.

4. It is entirely fallacious to suppose that root-crops gain a large amount of nitrogen from atmospheric sources by means of their extended leaf-surface. No crop is more dependent on nitrogen in an available condition within the soil; and if a good crop of turnips is grown by superphosphate of lime alone, it is a proof that the soil contained the necessary nitrogen. In fact, provided the season be favourable, the condition of land,

so far as nitrogen is concerned, may be more rapidly exhausted by the growth of turnips by superphosphate than by any other crop.

5. A characteristic difference between the uncultivated and the cultivated turnip root is, that the cultivated root contains a much lower percentage of nitrogen and a much higher percentage of non-nitrogenous constituents, especially sugar, by the accumulation of which the percentage of nitrogen is reduced. Yet it is under the influence of nitrogenous manures that the greatest amount of the non-nitrogenous substance—sugar—is produced.

6. If nitrogenous manures are used in excess, that is, in such amount as so to force luxuriance that the roots do not properly mature within the season, there will be, not only a restricted production of root, but an undue amount and proportion of leaf. In fact, the higher the nitrogenous manuring and the heavier the soil, the greater is the tendency to produce a large amount of leaf.

7. In the case of both common and Swedish turnips, the leaf contains a much higher percentage of dry substance than the root; and the dry substance of the leaf contains a much higher percentage of both nitrogen and total mineral matter than does that of the root.

8. Common turnips yield a much higher proportion of leaf to root than Swedish turnips; and if the leaf be unduly developed, there may even be more nitrogen, and more total mineral matter, remaining in the leaf to serve only as manure again, than accumulated in the root to be used as food. In the case of Swedish turnips, however, not only is the proportion of leaf to root very much less under equal conditions of growth, but the amount of dry matter, of nitrogen, and of mineral matter, remaining in the leaf, is very much less than in the root. In fact, whilst in the case of common turnips a very large amount of the matter grown is accumulated in the leaf and only serves as manure again, in that of Swedish turnips a comparatively small proportion of the produce is useless as food for stock.

9. The root of the Swedish turnip contains a less percentage of water, that is, a higher percentage of solid matter or food-material, than that of the common turnip. The dry or solid matter of the Swedish turnip root also contains a lower percentage of mineral matter, and consequently a higher proportion of organic food-substance.

10. The more deeply and powerfully rooting, and more vigorous mangold, is sown earlier, has a longer cycle of growth, and even under the same conditions as to manuring, yields more produce per acre than either common or Swedish turnips. It

requires, however, for full crops, much heavier dressings of manure.

11. The proportion of mangold leaf to root is, as a rule, very much less than in the case of common turnips, but more than in that of Swedish turnips.

12. With the more extended root range of the mangold, it is less dependent on continuity of rain when growth is once well established; and it bears, or rather requires, for its full development, a higher temperature than the turnip.

13. The mangold root contains a higher percentage of solid matter than either common or Swedish turnips. But whilst the turnip leaf contains a much higher percentage of dry matter than the turnip root, the mangold leaf contains a much lower percentage of dry matter than the mangold root; and also a very much lower percentage than the turnip leaf.

14. As in the case of turnips, the dry substance of the mangold leaf contains a much higher percentage of both nitrogen and mineral matter than does the dry substance of the root. Indeed, the dry substance of the mangold leaf contains not far from twice as high a percentage of mineral matter as that of the turnip leaf; but it contains upon the whole a rather lower percentage of nitrogen than that of the turnip leaf. It would seem that the mangold leaf is more fully exhausted of migratory organic matters in the greater development of the root, than is the swede leaf, and more still than the common turnip leaf.

15. Superphosphate is much less beneficial to mangolds than to turnips. In mangolds, as in turnips, the amount of dry substance grown has a very direct relation to the amount of nitrogen available within the soil. But more vegetable substance was produced, and more stock-food yielded, from a given quantity of nitrogen applied to mangolds, than to either description of turnips. By the application of nitrogen to the soil for mangolds, there was, in many cases, an increased assimilation of about a ton of carbon per acre from the atmosphere.

16. Taking the average of six years, the amount of nitrogen recovered in the increased crop of mangold roots was about 60 per cent. of that supplied when nitrate of soda was used, about 52 per cent. when ammonium-salts, about 50 per cent. when rape-cake, and about 46 per cent. when an excessive mixture of rape-cake and ammonium-salts was employed. There was, of course, an additional amount accumulated in the leaves, but these were annually returned to the soil as manure.

17. When farmyard-manure is applied for mangolds, larger amounts of nitrogen are supplied per acre than were used in any of the Rothamsted experiments with artificial manures, a less proportion of the nitrogen supplied is recovered in the increase

of crop, and more remains for future crops. It is the nitrogen of the liquid dejections of the animals that is first rendered available within the soil, then that of the finely comminuted matter mixed with some secretions in the solid excrements, and finally that of the litter.

18. As in the case of turnips, these assumed restorative crops are themselves pre-eminently dependent on manure for their development. They produce a large amount of vegetable substance, but a large amount of the manure remains in future crops; whilst, of the substance grown, that accumulated in the leaf is at once manure again, and of the portion used as food by far the larger proportion of the constituents valuable as manure is eventually recovered as such in the excrements of the animals. When, however, the roots are consumed for the production of milk, the loss to the manure will be greater than when they are consumed by either store or fattening stock.

19. The selection of the proper description of roots to be grown cannot be settled merely by a consideration of the amount of produce obtained from a given quantity of manure, of the proportion of the crop which is available as food for stock, or only remains for manure again, or of the high or low percentage of solid matter in the food portion of the crop. The general economy of the farm, the character of the soil, but more especially that of the climate of the locality, must also be taken into account. The great influence of climate is strikingly illustrated by the different proportions in which the different descriptions of roots are grown in different divisions of the United Kingdom.

20. The experiments showed a higher percentage of dry matter in Swedish than in common turnips, and a higher percentage in mangolds than in swedes. But, with each description of roots, the range in the percentage was considerable, according to season and to manuring. The percentage of dry matter was the lower, the greater the excess of nitrogenous manure, the greater the luxuriance, the larger the crops, and the less matured the roots; and it was, conversely, the higher the more matured the roots.

21. The percentage of mineral matter in the roots was the higher, the greater the luxuriance, and the more crude and unripe the roots.

22. The percentage of nitrogen in the roots was very small, but very variable. It was the higher the more nitrogen was applied by manure, the greater the luxuriance, and the less matured the roots; and it was the lower the riper the roots.

23. Nearly two-thirds of the dry substance of mangolds was found to be sugar. The percentage of sugar was the greater the

more mature the roots; and it was consequently the greater in the roots of the smaller crops. But the amount of sugar per acre was much the greatest with the largest crops; that is where the most nitrogen was applied in the manure. The roots grown by farmyard-manure alone contained more than one ton of sugar per acre; and by the addition of artificial nitrogenous manure to the farmyard-manure, there was an increase of more than half a ton of sugar per acre. In several cases the addition of artificial nitrogenous to a complete mineral manure, increased the production of sugar by more than a ton per acre.

24. By the addition of nitrogenous to a complete mineral manure, 1 lb. of nitrogen applied as nitrate of soda yielded an increase of 22·1 lbs. of sugar; 1 lb. nitrogen as ammonium-salts 19 lbs. of sugar; 1 lb. as rape-cake 28·8 lbs. of sugar; and 1 lb. of nitrogen applied in excessive amount in a mixture of rape-cake and ammonium-salts, gave an increase of only 13·7 lbs. of sugar.

25. In ripened products by far the larger proportion of the nitrogen exists in the most favourable food-condition of albuminoids, or protein compounds; but in unripened ones, and especially in such succulent, crude, and immature productions, as feeding roots, a large portion of the nitrogen exists in the much less valuable condition of amide-compounds, and in some cases a not inconsiderable amount is in the non-food, or even injurious forms, of nitrates and ammonium-salts.

26. In mangolds, with their more luxuriant growth, and frequently greater immaturity when taken up, there is probably, as a rule, a less proportion of the total nitrogen in the albuminoid condition than in either common turnips or swedes. There is also probably a less proportion of amide-nitrogen, and pretty certainly a larger proportion of nitrogen as nitrates, and in other forms. But the range in the proportion of the nitrogen as albuminoids varies very much with each description of roots, being the less the greater the luxuriance, and the less matured the crop.

27. Feeding roots are essentially sugar crops. Although he percentage of dry matter varies considerably with each lescription of root, according to the conditions of growth, the verage amount of dry matter may be taken as, approximately, per cent. in white turnips, 9 per cent. in yellow turnips, 1 per cent. in swedes, and 12·5 per cent. in mangolds. Of the ry matter of white and yellow turnips nearly, or more than ialf, may be sugar; of that of swedes more than half; and of hat of mangolds nearly, or as much as, two-thirds may be sugar.

8. In cereal grains, the proportion of albuminoid matter to -nitrogenous food-material is about as 1 to 6. In roots the

albuminoid ratio varies very greatly; but it is probably seldom more than 1 to 12, and frequently as low as 1 to 20 or more. The ratio will probably, as a rule, be lower in swedes than in common turnips, and lower still in mangolds.

29. With roots, should be given other foods, richer in albuminoid matters, and which contain a higher proportion of albuminoid to digestible non-nitrogenous substances; but they are, by virtue of the large amount of sugar they supply, very valuable for meeting the respiratory requirements of the animals, also for fat-forming, and for milk production.

30. Both the quantity and the quality of feeding roots, and consequently the feeding value of the crop, depend greatly on the description grown, and on the character and amount of the manure, and especially on the amount of nitrogenous manure, employed. Independently of the necessary consideration of the general economy of the farm, the choice on these points must be guided, partly by the character of the soil, but very much more by that of the climate of the locality.

2.—*Manuring Mangolds.* By BERNARD DYER, B.Sc., F.C.S., F.L.S., Consulting Chemist to the Devon, Essex and Leicester Agricultural Societies.

DURING the past three seasons experiments have been carried out under the auspices of the Essex Agricultural Society, for the purpose of ascertaining the greatest extent to which artificial manuring can be economically carried for the mangold crop. This crop is perhaps of more importance in Essex than in the West of England, where grass land is more abundant; but even in the western and in most of the southern counties it is a sufficiently important crop to make the results of any carefully conducted experiments relating to it interesting to readers of this Journal.

A short summary of the work carried out for the Essex Society in 1887 by Mr. Rosling and myself appeared in p. 343 of last year's issue of this Journal. Mangolds were grown in 1886 under various manurial treatments, and in 1887 oats were grown on the same plots without further manure, in order to see how far the high manuring of the mangolds and the removal of a large crop might affect, for good or for evil, the subsequent yield of oats. The conclusion derived from these trials was that heavy manuring for mangolds, with the production and removal of a larger crop of roots, increased the following crop also, negativing the view often held that the production and

removal of a larger crop of roots necessarily so exhausts the soil as to make the next crop suffer.

In 1887 a second set of experiments was carried out on mangolds. The dryness of the season was not favourable to the full action of the liberal dose of manure applied to some of the plots, but the results—as stated in the summary already referred to—showed that a tolerably heavy outlay on artificials was well repaid, and that they were, on the whole, more economical than dung, as far as regarded the single crop. Some of the dressings were so heavy that particular interest attached itself to the yield of the oat crop which was grown in the same field last year without further manuring. As before, it was found that, directly or indirectly, the high manuring of 1887 had good effects in 1888—perhaps owing to some extent to excess of nitrate of soda retained during the winter; for, although nitrate of soda is very soluble and easily washed down into the drains or the subsoil in a wet winter, a dry climate and a fairly close soil might have preserved some of the earliest top-dressing of nitrate which the mangolds did not use up. But the effect on the oats was much more probably due to the indirect manuring received by the oats from the ploughed-in tops and decayed rootlets of the mangolds, which would be more abundant on the highly manured and highly yielding plots than on the others, and would preserve nitrogen in an organic form—the manure thus acting, as it were, to some extent twice over.

We regard this demonstration that high manuring, even with nitrate of soda, was attended with benefit to the second crop as very valuable, because farmers are generally very much afraid of what are sometimes mis-called "stimulating" manures for root crops, on the ground that they may be unduly exhaustive of the land. The Table on p. 325 gives a brief summary of the experiments, showing how the high manuring improved, not only the mangolds, but the (otherwise unmanured) oats that followed them. For more detailed results the reader must be referred o the Report of the Essex Society, which will be shortly pubished. (Application for this Report should be made to Mr. F. Whitmore, Secretary, Essex Agricultural Society, Chelmsford.)

Comparing the unmanured land with the four undunged but artificially dressed plots, we see that artificial dressings, including 4 cwt. nitrate of soda per acre, produced on the average only 5½ tons per acre increase of mangolds. The same plots, without further manure, gave 10 bushels per acre more oats than the unmanured plots. Further, if we compare the merely dunged plots with those that were heavily dressed with artificials in addition to dung, we find the dung and artificials giving

4 tons per acre more mangolds, and 14½ bushels per acre more oats than the dung alone.

Manure per acre.	1887. Mangolds per acre.		1888. Oats per acre. Grain.	Straw.		
	tons.	cwt.	bushels.	tons.	cwt.	qrs.
Average of 2 unmanured plots	9	18	66½	2	0	0
12 tons dung	11	18	69½	2	2	1
Average of 4 plots with 12 tons dung per acre, and artificials, *excluding nitrate of soda*	13	12	69½	2	1	1
Average of 4 plots with 12 tons dung per acre, and 2 *cwt. nitrate of soda*, with and without other artificials	15	12	74½	2	4	1
Average of 4 plots with 12 tons dung per acre, and 4 *cwt. nitrate of soda*, with and without other artificials	15	17	84	2	4	2
Average of 4 plots without dung, but with artificials, including 4 cwt. nitrate of soda	15	8	76½	2	2	2

Our mangold experiments are not yet sufficiently complete to enable us to decide what dressings are on all grounds to be regarded as most profitable; but were I asked in general terms what I thought to be the best dressing for mangolds on a clay soil or on a fairly heavy loam, I should advise the liberal use of nitrate of soda. If dung be used at the rate of 12 tons per acre, probably 2 cwt. of nitrate of soda, in successive top-dressings, one after singling out and one later, will be a suitable quantity, though even a third cwt. may sometimes be advantageously applied; and 3 cwt. superphosphate at seed time will be found to assist ripening. If no dung be used, I should be inclined in most cases to suggest 6 cwt. guano, or 5 cwt. superphosphate, and 4 cwt. nitrate of soda, the guano or superphosphate and 1 cwt. nitrate being sown with the seed, and the remaining 3 cwt. in three top-dressings of 1 cwt. each. The guano should be Peruvian of the cheaper kind, rich in phosphates and low in ammonia.

Our experience in Essex, on a soil* that is certainly in good condition, seems to show that such a dressing is more economical than dung, as far as regards immediate results, and even as regards those of a second year.

No farm farmed under ordinary conditions can produce anything like a sufficiency of dung. To supplement what dung

* A well-farmed heavy loam resting on a subsoil of clay, which subsoil contains calcareous nodules.

we have, we may, for mangolds, either dung heavily one field, and rely wholly on heavy artificial dressings on another in a given year; or we may spread the same total quantity of dung over both, and help both with a less quantity of artificials. No doubt on many light soils potash would be needed in addition to nitrogenous and phosphatic manures—and in some localities salt is useful, though not in others.

It should be remembered that the Essex Experiments are carried out under drier skies than are known in the West of England.

3.—*Allotments in the Neighbourhood of Eynsham Hall.*

I HAVE examined a great many allotments in this neighbourhood, and taking into consideration the quality of the land, I do not find the crops grown are commensurate with the labour bestowed on them. This seems to me to arise generally from the want of sufficient manure and thorough cultivation combined.

I believe this state of things may be altered, and I now propose a remedy.

There are three available artificial manures that, for want of dung, will answer the purpose of the allotment holder, and give him a good return for his labour and expenditure.

These are Basic Slag, containing phosphoric acid and lime; Kainite, containing potash; and Nitrate of Soda, containing nitrogen. These three substances—phosphoric acid, potash, and nitrogen—are in reality the only things found in dung that can be said to have a real money value.

A ton (2240 lbs.) of good dung contains about 4 to 9 lbs. of phosphoric acid, 9 to 16 lbs. of potash, and 9 to 15 lbs. of nitrogen—say a total weight of 22 to 40 lbs. All the rest of the ton is made up of water (say 65 to 80 per cent.), a blackish substance, of not more value as a manure than rotten sawdust, and some other things that already exist abundantly in all soils.

Of course if dung could be had at a fair price, the allotment holders could have nothing better or handier, but a poor man cannot easily get it in quantity.

In order to give the holders of allotments and gardens a ready means of manuring their ground, and keeping it in high condition, I propose that my Home Farm management shall facilitate the supply of small quantities of the manures I have mentioned above, at the following prices:—

Basic Slag	14 lbs. for 3*d.*
Kainite	14 lbs. for 5*d.*
Black Top-dressing Mixture, containing Nitrates	14 lbs. for 8*d.*

After a short trial on this provisional basis, I think it will be quite possible to get an independent shopkeeper in each village to start as seller of these manures, and thus place them easily within reach of all allotment holders.

Moderate quantities of each of these substances will enable cottagers to try results for themselves with all the crops usually grown on allotments. Seven lbs. basic per square pole will be a good dressing for potatoes and roots of all kinds, leaving a fair amount in the soil for a future corn crop, and not to be worked out for some years; 3 to 5 lbs. of kainite per pole for potatoes, beans, and clover, to be used mixed with basic.

Two and a half to five lbs. of the top-dressing per pole, applied at several times between showers, in the months of April and May, will be a good dressing for potatoes, roots, cabbage, corn (already dressed with basic), &c., but not for beans, peas or clover.

The basic and kainite should be raked into the soil in the autumn or in the spring, before putting in the seed; and the top-dressing always applied in the spring.

With plenty of manure, I believe that cottagers will find it their interest to double dig the ground (keeping the upper soil at the top) for potatoes, turnips, carrots, cabbage, celery, &c.

They will thus get much larger crops than by ordinary digging, and more especially in dry seasons.

Good crops of onions may be grown with these manures.

This offer of manures is made to cottagers of the immediate neighbourhood only, whether they hold their gardens or allotments under me or any other landlord.

The manures will also be supplied to any small farmer of the neighbourhood who may wish to make some trials on a small scale.

A man will attend at the Home Farm on the last Saturday afternoon of every month until April, between the hours of 1 and 4 o'clock, to deliver the manure.

JAMES MASON.

NOTE.

Mr. Mason's Wheat-growing Experiments in Oxfordshire have a special bearing on those of our Experimental Committee in twelve other counties. They confirm the conclusion drawn by Mr. Knollys as to the effect of phosphate together with nitrate.

Using only round numbers, the produce of the unmanured plot is 30 bushels; superphosphate and nitrate add 16 bushels. Basic slag (containing phosphate) and nitrate, add 19 bushels.

(*Continued on p.* 330.)

Results of Wheat-

Carried out a

No. of Field in Ordnance Survey 183
Acreage of Field as per Ordnance Survey .. .. .. 16¼ acres (nearly)
Acreage under Cultivation .. .. 13½ acres
Divided into 27 Plots of Half-an-Acre each.

No. of Half-Acre Plots.	Manures.	Produce.					Cost of Production													
		Total Corn per Acre taken in Bushels of 60 lbs.		Total Straw and Chaff per Acre.	Total Produce per Acre.		Manual Labour.			Horse Labour			Wear and Tear of Cultivating and Thrashing Engine, Coal and Oil.			Seed.	
		bus.	lbs.	cwt.	cwt.	lb.	£	s.	d.	£	s.	d.	£	s.	d.	s.	d.
6	Dung, 14 loads per acre	43	35	41¾	65	11	3	0	6¼	1	16	8¼	1	11	10	12	0
2	Dung, 14 loads per acre. Top-dressing equal to 168 lbs. Nitrate of Soda per acre	46	56	42¾	67	100	3	5	9	1	17	8	1	12	1	12	0
2	Basic Slag, 16 cwt. per acre. Top-dressing equal to 302 lbs. Nitrate ..	47	36	38¾	64	28	3	0	9	1	13	4	1	12	4	12	0
8	Basic Slag, 8 cwt. per acre. Top-dressing equal to 302 lbs. Nitrate ..	49	16	40½	66	100	2	18	11	1	12	10¼	1	12	4½	12	0
1	Basic Slag, 8 cwt. per acre (no top-dressing)	33	46	32	50	90	2	9	10	1	10	2	1	10	10	12	0
1	Lime, 3 tons per acre	34	56	30¼	48	8	2	11	4	1	9	4	1	11	0	12	0
	Superphosphate (36 per cent. soluble, 4 cwt. per acre). Top-dressing equal to 302 lb. Nitrate	46	6	44¾	69	50	2	18	6	1	12	10	1	12	0	12	0
	No Manure	29	56	27⅞	43	18	2	6	6¼	1	8	8	1	10	8	12	0

..e field being experimental, and lately taken in hand, at least 15*s.* per acre for labour has been expended in excess of what would have been requisite under normal circumstances

GROWING EXPERIMENTS,

EYNSHAM HALL, 1887–8.

PRICES:

Head Corn, 3*s.* 10½*d.* per bushel; Tail Corn, 3*s.* per bushel; Straw, 35*s.* per ton.

PER ACRE.									VALUE OF PRODUCTS PER ACRE.											Balance for Management Charges, Interest of Capital, and Profit.			Remarks	
Cost of Manures.			Rent, Rates, and Taxes.			Total Cost,* less Management Charges.			Head Corn.			Tail Corn.		Straw.			Total Value.							
£	*s.*	*d.*	£	*s.*	*d.*	£	*s.*	*d.*	£	*s.*	*d.*	*s.*	*d.*	£	*s.*	*d.*	£	*s.*	*d.*	£	*s.*	*d.*		*s.*
3	10	0	1	4	0	11	15	0½	7	18	6	7	9½	3	12	7½	11	18	11	0	3	10½		
4	3	2	1	4	0	12	15	8	8	12	5½	7	6	3	14	9¾	12	14	9¼		..		Loss	1
3	9	6	1	4	0	11	11	11	8	15	4	7	0	3	7	9¾	12	10	1¾	0	18	2¾		
2	13	6	1	4	0	10	13	8	9	0	7	8	0	3	10	10½	12	19	5½	2	5	9½		
0	16	0	1	4	0	8	2	10	6	0	5	8	0	2	16	0	9	4	5	1	1	7		
2	9	0	1	4	0	9	16	8	6	4	11	8	0	2	12	11¼	9	5	10¼		..		Loss	10
2	12	6	1	4	0	10	11	10	8	6	6	9	6	3	18	3¾	12	14	3¾	2	2	5¾		
	..		1	4	0	7	1	10¼	5	6	11	7	0	2	7	5½	8	1	4½	0	19	2¼		

B.—The Dung is charged at the conventional price of 5*s.* per ton.
C.—The Nitrogenous top-dressing was applied at several times, between showers, each dressing containing 33¼ lbs. Nitrate.

These two plots, taking into account the whole cost of production, give the best money balance, in both cases over 2*l.*

Basic slag alone, lime alone, dung alone, give an increase respectively of 14, 15, and 13 bushels. In the two last cases the heavy cost of the manure and the haulage practically reduce the profit to nothing, or to a loss. Basic slag alone is credited with a balance of 21*s.*—but the unmanured plot is credited with 19*s.*

Mr. Mason's explanation of the only three substances in manure having a real money value deserves consideration. It may, however, be suggested that he makes no allowance for the power of the black stuff (carbon) in dung to act as a storehouse of nitrogen,* in other words, to be what farmers call a lasting manure. Whether the expense on the lime has a lasting value, or any value, probably depends on the nature of the soil, as to which there is no information. T. D. A.

4.—*Rye-grass in Permanent Pastures.*

At a recent meeting of the Royal Agricultural Society, Professor Carruthers, Botanist to the Society, in answer to Earl Cathcart, said Mr. Fream's paper, in the last number of the 'Journal,' was undoubtedly a very important one. Mr. Fream instituted a series of experiments by the examination of small portions of turf from pastures, cut away to the depth of 9 inches from various parts of England and Ireland. It was quite well known to those who had experience in such matters that in cutting away to a depth of 9 inches of turf, the deep-rooted plants which belong to the pastures were injured, so that the results would not be a fair indication of the actual plants that were growing on the pasture. He was still of the opinion that the views which he had expressed, and which agreed with those advocated by Mr. De Laune, were the true views in regard to rye-grass. In the first place, the rye-grasses were short-lived. No one had yet said that they were annual grasses. They stayed for two or three years and then disappeared. This view was held by Mr. Martin Sutton in his book on 'Grasses,' though Mr. Sutton was an advocate for the use of rye-grass. Mr. Sutton said that rye-grass is a shallow-rooted grass which lives on some soils for a short time on the surface until it exhausts the soil and then disappears. That this was the case [illegible] observe for himself. Only a few days ago he

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* See Paper on the Action of Manures, pp. 309–310.

(Mr. Carruthers) had examined some very fine plants of rye-grass which had grown from seed this year on a piece of ploughed land on which no crop was grown. These plants were remarkably vigorous, and produced no less than eighty or ninety flowering stalks; they had no depth of root and no hold upon the ground; when pulled up they brought with them a shallow saucer-shaped mass of surface soil. What he contended was that these rye-grasses, with their shallow roots and short life, were the great cause of the invariable deterioration of pastures that were laid down eight or ten years ago, and he considered the case against rye-grass fairly proved by this fact—that wherever perennial grasses had been adopted and put down to pasture, as had been the case in his own knowledge for eight or ten years, the pastures had gone on improving. Mr. Caird had shown, in his recent paper in the 'Journal,' that the perfection of a good permanent pasture had been secured by Mr. De Laune. A large number of our plants were only annual, dying down each year root and stock. They disappeared every winter, and yet these plants adorned our hedgerows every year, because the seeds were preserved. Whatever plants were persistently rejected by stock were the plants that flower and seed and increase in number on a pasture, while all the good plants are eaten down by the stock, and the seeds prevented from being reproduced. He had recently examined a meadow which, six years ago, was laid down in pasture, and in the mixture was included one-eighth of a pound of dogstail to the acre. This pasture would be said, by an incautious observer, to consist just now entirely of dogstail, the fact being that the sheep had kept low the good grasses which had thus not been allowed to throw out flowering stalks, and the dogstail had year after year scattered its seed, so that the field appeared to be completely covered with it. He believed this was the meaning of the appearance of rye-grass in so many of our pastures. He found that the unanimous testimony was that stock rejected rye-grass for other grasses wherever it was found, and consequently the rye-grass was allowed by the stock to grow and disperse its seeds so as to increase enormously. Instead of being a testimony in favour of rye-grass, this was a strong testimony against it. If he were asked by a farmer what to avoid in laying down land to pasture, he would advise him to go over his pasture in the autumn, and observe what were the plants which had gone into seed, having been rejected by the stock; he would find that the bents consisted of dogstail, of rye-grass, of agrostis, and of other grasses, which formed no element in the real food of the stock. The only other point which he would wish to refer to was that the materials which Mr. Fream had found to form so important

an element in pastures consisted not only of rye-grass, but of a number of other grasses, and that if they were to have an estimate of the value of these pastures depending on the kind of grass which Mr. Fream had found most frequently there, they might consider that the best pastures would be those made up of *Lolium perenne*, *Cynosurus cristatus*, *Holcus lanatus*, and *Anthoxanthum odoratum*. He would ask any practical farmer in that room if he could recommend these grasses as the materials for forming a pasture. Every one of the grasses occupied an inferior position, and some of them were useless weeds, which were rejected by all stock, and which were of no value whatever in the formation of pastures. The valuable pastures which had been produced by Mr. De Laune, by Sir John Thorold, and by Mr. Mark Stewart were not only every year improving, but they supported more stock than the old pastures. The short life of rye-grass was testified in Mr. Fream's own article in a letter which he quoted from Mr. Young. He believed that Mr. Fream's paper, instead of establishing rye-grass as an important element in our pastures, would throw fresh light on the whole question, cause more attention to be directed to it, and secure the complete elimination of rye-grass from permanent pasture in the future.

5.—*Prickly Comfrey.* By Professor JAMES LONG.

VERY much less has been written with regard to this estimable forage plant than was the case a few years ago, when it was so strongly recommended by numerous writers to the notice of the agricultural public. For what reason it would be difficult to say, but comfrey has not enjoyed so great a popularity as it deserves. I have found it in all parts of the country, grown under all sorts of conditions, on a variety of soils, but seldom in large quantities, and in hardly any case have I found it thoroughly cultivated and properly manured. All growers who have an experience of the plant admit that it is a nourishing food, and one which yields a large bulk of fodder. They also allow that with plenty of manure it responds well, and that it can be cleaned with ease, and yet these very people decline from some incomprehensible reason to grow it to a larger extent. It is true that in some instances they have found it difficult to get their cattle to eat it, but I am of opinion they can have persevered very little, for horses will eat comfrey as well as cattle and pigs, and though many animals reject it at first, they [illegible] induced to eat it with a relish when they have become

used to it. There are two varieties of prickly comfrey, one which is common in this country, and the other which is called the Caucasian or solid stem. This plant has a broader and greener leaf, it is coarser and larger throughout, and the prickly points which are common to the comfrey plant are much more objectionable on account of their great strength and number. Undoubtedly this feature is a cause of the plant being rejected by cattle so often. It is difficult to understand why this Caucasian variety is preferred, for although it is called the giant comfrey, it certainly does not yield so much food as the ordinary variety. Comfrey can be cut after the first year at least four times, the first cut being taken early in May and the last late in September or in October, in accordance with the date of the early frosts. The cuts are in proportion to the quality of the soil and the amount of manure and cleaning which the plants have received, as well as to the number of plants which are set per acre. Comfrey will grow on almost any soil, and the plantation is made either from root-cuttings, or from crowns of old comfrey plants well cut up into a large number of pieces, for even a half-inch cutting from a root will grow, and in this respect, when it is desired to remove a plantation, comfrey is as bad as horseradish. A plantation made from these cuttings, however, does not come into good bearing until the second year. If it is requisite, the first year it should be taken from crowns, of which several may be removed from every existing plant. On stiff soil which has plenty of depth the plants may be set two feet apart; on poor soils, however, they are often set much closer, in order that by heavy manuring a larger yield may be obtained as from heavy loam. It is a good plan to commence the cutting before the plant is mature, that is to say, before it has flowered, as at this time the stems are coarse and extremely prickly; moreover, the extreme time occupied in obtaining the growth, which is chiefly all stem, is a loss to the second cutting, which should also be taken early. In one instance a quarter-acre plantation, which was thoroughly well cultivated, was measured off and the crops weighed, and I found that they averaged upon the year's cuttings between 70 and 80 tons per statute acre. As each plant is ready for cutting it is grasped by the arm and cut through with a sickle, and given green to the cattle. At the agricultural school at St. Remy, in France, experiments have been made in the growing of comfrey of the Tartarian variety, probably the Caucasian as it is called in England. Upon the average of five years each hectare has produced 130 tons per annum, or 52 tons per acre English. Although comfrey is a plant which contains a large proportion of water, it must be admitted that this is an extraordinary yield.

That it is good for cows there can be little doubt. A few years ago some of my own cattle were taken from the pastures, tied up, and fed upon comfrey alone for a considerable period. Details of the experiment were published at the time, but there was no falling off in the quantity of milk yielded, and no perceptible difference was found in the quality or flavour, nor was any difficulty experienced in getting the cows to eat it. In many cases the animals rejected or left the thick stems, but these were cleared up by the pigs. Some horses have taken to it readily, others have rejected it, but have been induced to eat it when mixed with chaff. I tried planting comfrey in plantations, both under the trees and in the space between them. In the latter it succeeds well, but in the former the plant grew tall, but yielded a very small quantity of food. In gardens of very heavy land, which cannot be cultivated sufficiently well for other crops, this plant may be grown, and wherever stock is kept I am of opinion that it may be grown with profit, more especially as it costs very little to cultivate, one plantation lasting for a great many years.

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6. *On Dairy Farming, and How to Improve it.* By the Right Hon. Sir T. D. Acland, Bart.*

Sir T. D. Acland commenced by asking what kind of information it was they wanted on the subject of dairy farming? Did they want to know whether their practice in Devonshire was right or wrong? Secondly, did they want to know whether the method and the art of making it needed improvement? Thirdly, were their mechanical appliances in use the right ones, or did they want others? and did they want expensive ones or cheap ones? Again, should they pay greater attention to the scientific principles of milk in its different stages? Or, lastly, was it in the mode of marketing that they wanted improvement?

Dealing with the last point, he said that as long as they had got a market for sweet, well-made Devonshire butter, by all means let them keep that market, and get the best price they could; but the question was, whether the market was not changing, especially since the introduction of the cream separator. It is often said that the two enemies of the English farmer were the foreigner and the middle-man; but the foreigner did not hurt them in London by underselling, but by overselling the native producers; and so far from the middle-man being the enemy of the farmer, the French succeeded in

* An address delivered at the Exeter Chamber of Agriculture, Oct. 26, 1888.

keeping the London butter-market because they had brought the system of the middle-man to perfection.

With regard to the means of spreading information, there were before the public at the present time two, if not three, plans. The Government, taking into account the very strong feeling that existed among English agriculturists, appointed a Royal Commission, and that body had issued a report in which they stated that what was wanted at the present day was teaching, and they advocated the establishment of normal schools in order to train up teachers. He was not too fond of these Government schools, and he knew too much about one such Institution to be enamoured of a proposal of that kind. He might throw aside, therefore, the idea of another Government institution to teach the farmers. Were they prepared to support special technical schools to instruct every industry that was in a bad way? Then the Commission proposed to set up six district schools. Were the farmers going to send their daughters seventy or eighty miles away from their homes at so many guineas per month, in order that they might be taught how to make butter?

The Government, out of a recent grant of 5000*l.* in aid of agriculture, had very wisely decided not to set up any new thing, but to assist something which was actually in operation. They had sent down Mr. Peel, a very able man, to witness experiments of the West of England Society, and it might be expected that something of advantage to the farmers would be the result in the shape of State aid.

Instead of establishing the district dairy schools proposed by the Royal Commission, he much preferred that they should have itinerant teachers going from farm to farm, or from market town to market town, delivering lectures and interesting their friends in the subject. He would respectfully urge all the large landowners of this country to engage the services of competent butter-makers, and invite small gatherings to attend demonstrations, or going around to the different farms, seeing the appliances that they had got, and taking measures to see that they did their best with them.

He also recommended the Chamber to apply to the Bath and West of England Society to open one of these Dairy Schools in Exeter.

7.—*Dairying in Denmark.*

THE Agricultural Department has issued an interesting note on agriculture in Denmark, from which we make a quotation:—

The great feature of the agriculture of Denmark is its dairy farming. In respect of corn growing many other countries can beat the Danish farmer, but not one can beat him in respect of the management of dairies, and in the production of butter. "So much original work has been done in this direction, that Denmark in its relation to other countries may, as regards dairy management, be much better described as their teacher than their pupil."

Yet only twenty-seven years ago Mr. Vice-Consul Rainals wrote as follows concerning the butter made in Denmark:—"The butter, or the article sold in the market by the yeomen-farmers under that name, is so execrably bad that it appears strange that such produce can find a sale, but the consumption of butter is extremely large, so that greater importance is attached to quantity than to quality." And Mr. Macgregor says, "If the character of dairy management may be spoken of as peculiar to the country this is the case only as regards the last twenty or thirty years. The first development it owes to the Holsteiners, and through them, to some extent, to the Dutch; while, as regards the progress which has taken place in more recent times, advantage has been freely taken of any improvements which could be introduced from abroad."

It seems that the Holsteiners first introduced improvements in butter-making into Denmark, and it became general about the middle of the present century to use shallow dishes for holding the milk during the separation of the cream, and butter was made in the Holstein churns worked by hand or horse-power, and having the same forms as those now in use. Through the impulse first given by the Royal Danish Agricultural Society, and afterwards at the expense of the State, men of science set about solving problems and making investigations relative to conducting dairy management upon rational principles. Among these men of science Professor Segelcke must be named, who has done so much for dairy farmers.

By these men the thermometer and scales were introduced, and trustworthy and detailed book-keeping followed, while thorough and systematic instruction in practical dairy management was promulgated. Foreigners come from far to take lessons in dairying in Denmark.

Later on the milk was placed in deep cylinders. Ice was generally used. The manufacture of dairy utensils of all kinds, for home requirements and for export, assumed large proportions.

Then the farmers paid attention to the selection, feeding, and management of cows. Autumn calving was adopted and the bulk of the butter was made in the winter. Large owners and farmers showed the way, the small men followed.

"Now almost all Danish agriculturists, whether the landed proprietor with his 300 cows, or the crofter with his one or two, with equal zeal and with equal profit, comparatively speaking, take part in the manufacture of butter."

With the small farmers this has been mainly brought about by the adaptation of centrifugal power for skimming the milk introduced into Denmark about ten years ago. At this time steam centrifugal separators are employed in all parts of the country by large proprietors and farmers, who buy up milk from small owners and occupiers: or co-operative societies are formed to establish factories, where the milk produced by the shareholders is consigned and made into butter.

At this time there are about 2000 centrifugal machines in daily use in Denmark, by which about half the milk of the 700,000 cows in the country is treated.

An idea in the advance of the butter-making industry may be obtained from the fact that between 1877 and 1882 the average annual amount of butter exported from Denmark was about 19,000,000 lb., while it had increased to 32,000,000 lb. in 1886, and to 35,000,000 lb. in 1887.

The skim-milk is not made into cheese, as the over-production of this article abroad has rendered its manufacture unprofitable, so that the milk is utilised for feeding pigs, whose exportation alive and in the form of bacon is considerable, and increases yearly. 250,000 pigs and 47,000,000 lb. of bacon were exported last year, against 43,706 pigs and 4,000,000 lb. of bacon in 1857.

It is estimated that the total value of dairy produce exported from Denmark is equal to an annual sum of 3,888,800*l.*

Danish cattle are principally of two breeds, the Angeln and the Jutland. The former is the best for dairy purposes, and the latter for meat-producing, though this has been immensely improved lately by selection as well as by judicious crossing.

Angeln cows are red, of small size, resembling Ayrshires in form and qualities. M. Tisserand, in a report to the French Government, entitled 'Études économiques sur le Danemarc, le Holstein, et le Slesvig,' in 1865, estimated the annual average milk production of these cows at 440 gallons per head. He adds, "The Angeln breed may, in fact, be regarded as one of the best milking breeds in existence."

Jutland cattle are black and white, or occasionally red and white, sometimes grey and white. According to M. Tisserand the cows give a maximum of about 320 to 340 gallons per head, but the milking qualities of the breed have been improved in recent years.

8.—*Dairy Farming in Denmark.*

A REPORT by Mr. Inglis, British Consul at Copenhagen, on the dairy farms of Denmark has recently been published by the Foreign Office. In 1887 there were 900,000 cows in the different Danish dairy farms, divided among 150,000 owners, and the total annual export of butter, which averaged 19,000,000 lb. between 1877 and 1882, rose to 32,000,000 in 1886 and 45,000,000 in 1887. This notable increase is attributed in great measure to the rapid increase of the use of the centrifugal cream separators, of which there are said to be 2200 in daily use. Not the least striking movement is the extension of the co-operative system to dairy farming. At present there are said to be 200 co-operative dairies, treating the milk of from 5000 to 6000 cows daily. Mr. Inglis appends the rules of one of these dairies, in which the terms of membership, the mode of withdrawal, the quality of the milk, and state in which each member is to deliver it at the central dairy, the winter feeding of the cows, the appointment and duties of directors, and various other matters are provided for. It is said that the system of paying for milk according to the quality of cream contained in it, which was introduced in 1886 in eight dairies, has proved an excellent means of awakening interest in the quality of the milk, and in making farmers more careful. Farmers go through a course of instruction in testing the fatty qualities of milk, and many of the younger dairy hands attend the five months' course of instruction at the Ladalund Farm. Official tables relating to the winter-feeding consumption, produce per cow, cost of such produce, and prices realised are given in the report, and "give an idea of the minute care with which every fact is registered and tabulated in a Danish farm." M. Boggild, in the official report in question, expresses the opinion that not more than one pound daily, per cow, of any kind of oilcake should be used; sunflower cake in small quantities is one of the cheapest foods known, but if more than half a pound is given the butter may acquire a peculiarly sweet and greasy flavour. Cotton-seed cake is not much used; carrots are the best root fodder, and it is believed that in future swedes and other turnips will be but sparingly used. Mr. Inglis has investigated certain depreciatory remarks in English papers on the quality of Danish butter, and he comes to the conclusion that the quality and uniformity of Danish butter are due to the great care devoted to its production, and to the beneficial influence exercised by the co-operative dairies, which lay down standards, and an English judge at the recent Copenhagen Exhibition emphatically asserts the purity of Danish butter and the utter absence of adultera-

tion on the part of the farmer. The report contains plates representing the ground-plan of a Working Dairy at the Exhibition, a section of the cream-separator most in use in Denmark, and other testing and separating appliances.

9.—*Time of Calving and Milk Yields.*

In experimenting upon the feeding of milch cows it is often necessary to be able to calculate the extent to which the flow may decrease under the influence of distance from calving. For the purpose of investigating this question, the milk-records of the Waushakum farm herd, South Framingham, Mass., as kept

TABLE I.—FOR WHOLE HERD.

Month from Calving.	No. of Monthly Records.	Average Yield per Month.	Month from Calving.	No. of Monthly Records.	Average Yield per Month.
		lb.			lb.
1	210	771	13	26	349
2	206	731	14	19	358
3	197	659	15	15	366
4	195	597	16	13	319
5	191	518	17	10	316
6	183	495	18	9	308
7	175	448	19	6	306
8	153	403	20	4	302
9	119	370	21	4	243
10	93	334	22	3	271
11	60	317	23	2	284
12	38	326	24	2	238

TABLE II.—FOR COWS THAT WENT DRY BETWEEN 8TH AND 12TH MONTH.

No. of Monthly Records.	Average Yield per Month.	No. of Monthly Records.	Average Yield per Month.
121	808	121	451
121	757	121	380
121	685	88	348
121	617	63	312
121	560	34	254
121	511	13	223

by the Sturtevant Bros., from December, 1886, to December, 1887, inclusive, have been examined for the American Government, who have published the results, arranging the milk yields of each cow, for each thirty days from calving. These records are :—

For 35 different native cows, and 59 calvings.
For 45 different Ayrshire cows, and 145 calvings.
For 3 different Jersey cows, and 6 calvings.

While the natives were kept, the feeding was liberal; yield being the objective point, regardless of the calves. While the Ayrshire cows were maintained, the feeding was lower, as befitted a breeding herd; and the records embrace the yield of many young animals in their first year of milk. For the whole herd, during the fifteen years, the calvings were quite well distributed over the year, no particular season for calving being desired; as the milk was disposed of at retail during much of the time. We give a table on p. 339 of the results under two heads: the first embraces every cow, farrows as well as those in regular calvings; and cows which only remained a few months in the herd. The second embraces only those cows which went dry between the eighth and twelfth month from calving.

For the Whole Herd.

	Actual Daily Milk Yield.	Theoretical Daily Milk Yield.	Actual Yield per Month.	Theoretical Yield per Month.
	lbs.	lbs.	lbs.	lbs.
1st Month	25·7	25·7	771	771
2nd "	24·4	23·4	731	702
3rd "	22·0	21·3	659	639
4th "	19·9	19·4	597	582
5th "	17·3	17·7	518	530
6th "	16·5	16·1	495	483
7th "	14·9	14·7	448	440
8th "	13·4	13·4	403	401
9th "	12·3	12·2	370	365
10th "	11·1	11·1	334	333

For the Cows that went Dry between 8th and 12th Month.

	Actual Daily Milk Yield.	Theoretical Daily Milk Yield.	Actual Yield per Month.	Theoretical Yield per Month.
	lbs.	lbs.	lbs.	lbs.
1st Month	26·9	26·9	808	808
2nd "	25·2	24·5	757	736
3rd "	22·8	22·3	685	670
4th "	20·6	21·3	617	610
5th "	18·7	18·5	560	555
6th "	17·0	16·9	511	504
7th "	15·0	15·4	451	459
8th "	12·7	14·0	380	418
9th "	11·6	12·8	358	381
10th "	10·4	11·6	312	346

If we examine the differences between the yields of successive periods, we do not perceive much uniformity. Yet if we calculate the average daily yield during each period, and estimate the falling off by percentage, we may note that the apparent decrease is about 9 per cent. of the yield for a preceding period; or the same percentage may be calculated on the total yields.

We have placed in column (Table, p. 340) the actual results tabulated, and alongside the yield of each period decreased by 9 per cent., and this we call the theoretical yield.

It would thus appear that the natural falling off in milk for each month from calving, is about 9 per cent. of the yield of the preceding month.

10.—*Farm and Market Poultry.* By W. B. Tegetmeier, F.L.S.

In a lecture delivered at the London Dairy Show last summer, Mr. Tegetmeier repudiated all idea of poultry farms being made profitable. They had been tried under almost all kinds of conditions, and had never proved anything but disastrous pecuniary failures; large speculators had lost thousands of pounds, and scores of smaller capitalists had lost hundreds, without one ever having succeeded in founding a successful poultry farm. The fact that large numbers of gallinaceous birds, whether fowls or pheasants, cannot be kept continuously on the same ground without becoming subject to disease, is fatal to the keeping of large numbers in one locality.

The large profits that are occasionally announced as having resulted from keeping a few head of poultry in one place were always displayed on incorrect balance-sheets. On the credit side was given the gross sum received for chickens and eggs, and on the other the amount paid for food. No charge was made for rent of land or buildings, for attendance, for killing, plucking, conveyance to market, cost of plant, or interest of capital. If in this erroneous manner a supposititious profit of 20*l.* on a flock of fifty hens could be shown, it was at once argued that 500 hens would produce a profit of 200*l.* per annum, the expenses for the rent of the necessary land, buildings, for attendance, &c., all being ignored, to say nothing of the certainty of disease where large numbers are bred together.

Successful poultry rearing for the market or table can only be done in moderate numbers at any one homestead, and therefore it always has been the industry of the cottager or small proprietor, the fattening and preparing for the large markets being done by the owners of the fattening establishments,

where thousands are not unfrequently penned, fattened, killed, and sent to market.

The subject of the best breeds of poultry for the farm was next considered. Here Mr. Tegetmeier drew a wide distinction between fancy or ornamental and useful or market poultry. As profitable poultry, he boldly asserted that the breeding of birds for shows had injured every breed that had been regarded as fancy fowls. The Dorkings, he asserted, were large, coarse-boned, and massive, from a cross with a grey Culm cock. The Spanish had been bred exclusively for face, plumage, and comb. The Minorcas, one of the most prolific breeds, were in danger of being bred only for huge indented upright combs. Andalusians had now become feather varieties, and Hamburgs had long been so.

Cochins and Brahmas had been bred for feathered legs, and had ceased to be even recommended as economic varieties. The Langshan he regarded as the best of the recent breeds, as the rearers were breeding them for quality rather than for feather. Game were bred for length of leg and neck rather than for plumpness of breast.

The amount of meat on the breast depended on the size and depth of the two pectoral muscles which are used in flight. A bird that did not fly had small development of these muscles, hence the poor breasts of Cochins and Brahmas.

For table fowl Mr. Tegetmeier recommended a cross between the old-fashioned short-legged Dorking, or the four-toed Surrey fowl, which now supplies the best birds to the London market, and the old-fashioned English fighting Game, or the Indian Game, so common in Devon and Cornwall, taking care that short-legged specimens be obtained, and not stilty birds.

To enforce his remarks on the high value of these crosses, the lecturer showed some live pullets and a cockerel. The lecture was also illustrated by several of the prize exhibits in the classes for dead poultry.

11.—*The Breeding and Selection of Dairy Cattle.*

Mr. Henry Simmons, of Bearwood Farm, Wokingham, read the following paper at the Eastern Counties' Dairy Conference at Sandringham :—

"In commencing to read a paper, in order to start a discussion on the above subject, namely, the 'Breeding and Selection of Dairy Cattle,' I am fully alive to the fact that perhaps at the present time no subject in connection with agriculture is of more interest or receiving greater attention from a

world-wide public (all being concerned, either as producers or consumers of the produce) than that of the most efficient and economical production of milk, and its further manipulation. The greatest pains and ingenuity are exercised to obtain the best and most approved machinery and utensils of all kinds in connection with the dairy. Shows and conferences are being held, and efforts made to establish dairy schools in all parts of the country, in order to disseminate knowledge on this all-important subject; and it certainly seems only natural and right, therefore, that the first and foremost aim should be to find out, as nearly as we can, by experience, what is the best system or mode of breeding likely to produce the best cow for the general public. I hope our discussion to-day may help forward the solution of this matter.

"GOOD COWS IN ALL BREEDS.

"It is admitted by all, however prejudiced we may be to our own particular breed or fancy, that good cows are to be found in all breeds of cattle, although they are less common in some breeds than in others. This arises from various causes, and may be due in some measure to the country, climate, soil, and the nature of the food; at the same time, I think that more is left with ourselves in the formation of good cattle by judicious thought and management than may at first sight appear to the casual observer. The first question is—What constitutes a good cow? The answer, I think, must be—The one that is the most profitable, rent-paying animal, looked at from all points. I do not purpose in this paper to go into the merits of the respective breeds of cattle, but rather to state from my own observation and experience what I think the best and most likely system to produce good cattle from any given breed. I do not like to hear any man or new-comer into a district set up his opinion too decidedly against the usages of that district, or to so run away with his own ideas or fancy as to drive on headlong in the belief that some particular breed is the best for all soils and climates. Such a man, and we often meet with him, generally, unless he sees his error in time, comes to grief.

"MILK AND SHAPE.

"The great and chief object is to obtain a cow that is a heavy milker; but you must obtain this without sacrificing form, size, or quality. This, I firmly believe, can be and is now extensively done, and reduced almost to a certainty, by careful selection and using fresh strains of blood. If the Shorthorn breeders, by losing sight almost altogether of milk

(as I think it must be allowed many of our leading men did), and looking only to colour, hair, and form, produced the grandest beef-making animals perhaps the world ever saw, but, as a rule, very deficient in milking properties, it stands to reason that by giving our attention solely to milk the opposite result will necessarily be obtained. To push either of these systems to the extreme is bad; we want the two so blended together as thereby to produce milk, form, and constitution. The fact that many of our most prominent breeders do now carry out this practice is evidenced by the great demand for their young bulls, purchasers knowing that in their management and selection these objects are kept steadily in view.

"SELECTING THE BULL.

"In starting a herd, no matter of what breed, it is necessary, after selecting the cows as carefully as circumstances will admit, to use only bulls from dams of known good heavy milking properties; and here let me remark in passing, the proposed Dairy Herd-book will be found invaluable if it can be started and carried out in a really practical manner. Having done this, then carefully note the quantity and quality of the milk given by each animal; this can be done by weighing the produce given by them respectively, say one day in each week, or, if practical enough, from your own observation. Then weed out from time to time for disposal as beef, or otherwise, all failing to reach such a standard as is considered profitable and satisfactory. Care and some patience are necessary in the case of heifers, as, although bred from known milking strains, they will sometimes, from various causes, do badly with their first calf, but when rightly descended they generally repay you with the second calf.

"Should it be found that the herd is leaning too much to milk, and losing flesh, form, or constitution, or *vice versâ*, then make such an alteration in the selection of the next bull used as is calculated to remedy the defect. I do not for a moment lose sight of the fact that with the greatest care mistakes may be made in the sire used that will take some time afterwards to rectify, but this, I think, is only the exception to the rule, and that by following the plan I have stated success in the main will result.

"CARE OF COWS.

"Having secured a good cow, the next thing is to take care of her, and this will never fail to be well done by any man who has given the thought and attention required, as before stated, to get her. It must follow as a matter of course. The

herd should be liberally and regularly fed with nutritious milk-forming food, and thoroughly milked out twice daily at stated times, and, above all, supplied with pure water and kept clean. The plan of allowing the calf to run with the dam is bad for milking results, the better system being to rear the calf by hand at a week old.

"Rearing Calves.

"The cow-calves will be reared, excepting those of bad form or colour, and from unsatisfactory dams, and passed in due time into the herd with their first calves when about two and a half years old; the bull-calves in ordinary herds being sold at a week old, or steered for feeding purposes. Even in some, if not most of the pedigree herds, steering might be practised more than it now is, with credit to the breeder and profit to the dairy interest; a proportion of those we see annually put up for sale make bad bulls, but would find ready purchasers as oxen.

"Crossing.

"Some years since, at Bearwood, we had a cow, a cross between Jersey and Shorthorn, but favouring most of the Jersey breed. She was first-prize cow in her class at the London Dairy Show, and took also a milking prize, in addition to various prizes at other shows. I mated her with a very heavy-fleshed Shorthorn bull, 'Caractacus,' 36,315, bred by Mr. Joseph Stratton, whose father first started his herd from extraordinary milking-cows, and she produced in course of time three cow-calves in succession, all of which took prizes at the 'Dairy,' 'Bath and West,' and other shows, and although of grand shape and form, proved remarkably heavy milkers and of excellent quality. The second calf she bred I entered at the London Dairy Show as in-calf; she was passed by the judges as by far the grandest heifer in the class, but doubtful as to being in-calf, and showing only beef-making qualities. This heifer calved at the time stated, and was a grand milker, thus proving that, although they all three took their sire's immense frame and substance (he weighed dead 240 stones of 8 lb.) they still retained the dam's milking powers, and in which, I believe, the sire played his part. This appears to me to be the class of animal, pure or crossed according to fancy, most likely to pay the owner for her keep, and leave something towards the rent—one that will do good work at the dairy, and make beef afterwards. A pure breed should be the chief aim, as crosses often do well the first time, but are very difficult to carry on. Will our Channel Island cattle-breeders do well to follow exclusively, according to showyard dictum, the system

of breeding to produce a mere milking machine of delicate constitution, or will they not do better to make our English-bred cattle of those valuable breeds combine, in some degree at least, the before-mentioned qualities of milk and beef-making frame? To please a lady's or gentleman's eye and grace the park is one thing, but to pay rent and earn a living out of them is altogether another and more difficult matter.

"DROP AFTER CALVING.

"One very serious drawback I have experienced in keeping fleshy cows giving a large quantity of milk has been from the disease known as the 'drop' after calving. I have, both in our Jersey, Shorthorn, and Devon breeds, for years suffered loss from this cause—more frequently with the Jersey and Cross-breds than Shorthorn or Devon cows—many of our cows as they increased in years falling victims to this complaint. I have no doubt feeding for exhibition has increased the risk; at the same time we have lost them in all stages of condition, and more particularly in the Jersey herd, from which we never exhibit. I have called in, with very little success, the assistance of many different veterinary surgeons; tried scores of so-called certain remedies and cures, both allopathic and homœopathic, before and after calving, including whisky and other alcohols, but in two cases out of three we have had to kill the animal. About two years ago I was mentioning this to a very large dealer in cow cattle, and he said, 'You kill them by kindness; do as I do. I calve some hundred of cows yearly, and never by any chance lose one from that cause.' He said, 'We let them calve in the grounds, or straw yards, where they chance to be, take no heed of them, only collect the cows and their calves once a week for market, and there the matter ends.' I have since adopted the same plan, not even milking them before or after calving, but simply leaving them for three or four days with the calf, letting nature take its own course before bringing them into the dairy. I have lost but one cow under this treatment, and I afterwards found my orders had not been carried out in her case. I merely state this as a fact in our own herd, to be taken by others for what it is worth.

"STILL ROOM FOR IMPROVEMENT.

"In this nineteenth century and clever age it seems somewhat strange to think or be told that we have much yet to learn in the breeding of dairy cattle, or the making of the very best articles from their produce; and yet in a letter I received only a few days back from a gentleman of considerable position

and authority, he says this: 'I am reading the evidence before the Committee on Agriculture and Dairy Schools. It betrays a lamentable amount of ignorance of dairying and cheese-making on the part of the farmers; it would seem as if they had to go to school to learn the first elements of their business.' If this is true, and I fear in some degree it may be said to be so, although we have many bright exceptions, can the same thing be said with regard to the breeding of our dairy stock? Certainly not. At the same time it is evident, on looking through many large herds of cattle, and hearing the owners complain of bad results from them, one cannot help seeing that much improvement may even yet be made by a little more care and thought in selection. The large sales of young pedigree stock now constantly held in all parts of the country, by giving farmers an opportunity of obtaining a suitable bull for their respective herds, instead of using an animal of chance breeding, are doing much to rectify this evil; and all concerned in agriculture now see from sheer necessity that, if farming can in any way be carried on to a profit, it must be done by hard work and thoughtful perseverance, and using every endeavour in our power to make both our land and our cattle yield a full and abundant increase. The old proverb says, 'God helps those who help themselves.'"

12.—*Dairy Farming in Arable Districts.*

[Abridged from Paper read by Mr. H. A. Howman, of Thane Hurst, at the Eastern Counties Dairy Conference, 1888.]

Possibilities.

If corn-growing as a paying business is so limited in its area as to justify us in saying that it is no longer a paying crop on the majority of English lands, this remark does not apply to what I am here to advocate to-day, the greater extension of dairy farming in those districts that up to now have believed that corn-growing is the only possible solution of the situation. Dairy farming does not require any special climate: it will do equally well in the dry climate of the eastern counties as in the moist humid one of the West of England. It does not depend upon a large area of the farm being in grass, because a larger bulk of suitable food can be grown under the plough than grown upon permanent pasture, with this immense advantage in favour of the plough land, that you can provide a succession of crops to follow each other, thus enabling you to carry out the essential point in the feeding of all stock—namely, variety.

There is nothing that conduces so much to the health and well doing of stock as the constant change in their diet. A few years ago a large area of grass land was necessary on a farm for the due carrying on of dairying, because if the season was favourable, and a larger bulk of grass was grown than the cows could consume, the area over which they fed was restricted, and more hay was made as a store against the winter wants; but if, on the other hand, a dry season set in, the cows required the run of the whole of the grass, and so the winter supply of food ran short, with the result that at the time of the year when milk sells at its highest price then there was no milk to sell, because the supply of winter food was limited, and therefore the cows were dried and turned into a straw-yard. And under the old system of cheese-making the cows were timed to calve all together, just before the cheese-making commenced; and when the season was over, the cows were dried and rested till the next commencement of the cheese-making season, thus losing several months' returns, which should bring in a substantial profit. It is true that the labour bill would be less, but a system that enables the employer to keep his men at work profitably all the year round must always be preferred to the one that only employs men during the summer, and turns them off during the winter to get their living as they can. Under the system of arable dairy culture, you are able not only to provide for the due carrying on of the cheese-making during the summer, but you are able when the cheese-making season has ended to then commence with your winter dairy, by selling milk at a remunerative price, bearing this in mind—that the milk-seller to whom you sell your milk will always give you a higher price if you only sell him your winter's milk than if you contract to supply milk all the year round. And this position has been prominently brought home to us during the last few summers, when the price of milk has fallen so low that there was no margin of profit left of any kind, and yet by reason of the contract that farmers entered into they were compelled to supply the quantity contracted for without being in a position to take advantage of the increased demand for milk. But if farmers would adopt the plan of keeping their milk at home during the summer months, and utilising it there either by cheese-making or calf-rearing, or pig feeding, or in any way that their local circumstances may show them to be a more profitable way, and by selling milk during the winter, they would be able to take advantage of any increased demand that may arise, than by the yearly contract, which absolutely prevents them from making the most of their produce. As an example, last summer, by reason of this freedom from a contract, I was enabled to take

advantage of the milk scarcity that arose, and deal with 1000 gallons a week at winter prices; whereas my neighbours who had entered into contracts were obliged to be content with prices varying from 4*d.* to 6*d.* per gallon.

Management.

Now, the question arises, how is it possible to so manage as to make the farm do this double duty of keeping at a full supply of milk during the winter as well as the summer, because the obtaining the maximum return from the farm is really the key to the position? It is only a truism to say that the dead charges remain the same, whether a half crop or a whole crop is grown, whether cows yield the maximum or the minimum, and it is only on the surplus after the dead charges are paid that the farmer can hope to realise a profit. If grass lands could be managed so as to yield as much in the winter as they do in the summer, and of as good quality, then the difficulties would disappear; but this not being so, we have to turn to the arable land to supply the deficiencies of the grass. And if I were asked to name the one thing that has contributed more than any other to solve the difficulty, I unhesitatingly name the "silo," having had several years' experience, dating from the time when Mr. Wood wrote his first account of what had been done on Lord Walsingham's estate. I have every year been gaining experience and confidence in the making of them, and last year I used forty-six silos on the estate where I was farming. The silo plays an important part in the system of arable dairy farming, because it is only by its help that we are able to preserve for future use the surplus that there may be of any of the green crops after we have taken the best of them for consumption. It is impossible to so arrange the cropping that each crop shall last just so long till the next is ready. They must always overlap each other, so that in case of accidents of weather or other contingencies, we are not left without food. Any surplus, therefore, when it gets unfit to be eaten by the cows by reason of age, is at once put in a silo, and it comes out again later on equally good for food as it was in its green state. The course of cropping is of course reversed. The question is not, How many acres of corn shall we grow, and what shall we do with the remainder? But, How many acres of green crop shall we grow? And the corn-growing takes a secondary place on the rest of the land. The green crops available are many and variable, but the staple ones that I prefer to depend upon are autumn-sown rye. The wheat stubble is manured and ploughed, and the rye sown as soon after harvest as possible; the earlier

it is got in the better it will stand the winter, and the earlier and the bulkier the crop will be in the spring; then directly after come winter vetches mixed with wheat or winter oats. These two crops come in for feeding in May, and almost if not quite equal with them comes lucern. These carry you on until the seeds are ready for mowing. The seeds I grow are the strong growing clovers and Italian rye-grass mixed, and I find these come more quickly and earlier for mowing than where more elaborate mixtures are used. Then the grass ground comes in for mowing and spring-sown vetches, and so you are carried on to autumn, when the seeds are ready to be mown a second time, and these will be all the better if they have had just a taste of sulphate of ammonia after the first mowing. Then comes in what I look upon as the most valuable crop of all—thousand-headed kale. This crop sown in April and well manured will be fit for cutting at Michaelmas; and if the stalks are left to stand, they will shoot again and yield another good cutting at Lady Day. The question of standing the winter depends in a great measure in cutting early enough in the autumn and getting the young shoots well hardened before the winter. Then come turnips and swedes, and so on to mangolds, when the round comes in again.

There are other green crops most useful, such as rape, and last year for the first time I tried, on Professor Long's recommendation, the sugar-cane (*Sorghum saccharatum*). I sowed the seed on June 6th, and, though it had no rain for six weeks, in September it had grown into a bulky crop from 4 to 6 feet high, and as a milk producer the effect was very marked.

Feeding.

The system in feeding the cows is as follows:—During the summer they are tied up in the shed during the day-time, and turned out at night when it is cool; in the autumn this is reversed until they come into the sheds for the winter. All the green crops are brought into the shed and passed through the chaff-cutter, and are mixed with silage and any purchased food it may be thought necessary to give them. The silage forms the backbone of the mixture, and, if possible, I try to have silage all the year round. The grass grounds are mown, and the grass either given green to the cows, or cut up into chaff and made into silage. No hay is made, as both cows and cart-horses do equally well without it. The part of the arable land that is not wanted for growing green crops is devoted to corn, either [illegible] or oats. I may mention that no sheep whatever are kept on the farm; and as the principal return must come from the cows, it is necessary that the cows should be kept up to their

maximum yield, and this on the same principle that you must grow the maximum crops, because the dead charges remain the same whether cows milk well or badly. I must not hide from you that the great difficulty in this question of arable dairy farming is the question of labour. It is a most serious item, because if you sell your milk and have to meet trains, you must have a sufficient supply of labour to do the milking to the minute. Everything must go like clock-work. The constant daily carting of the green food to the cows in the sheds is, of course, a source of expense, as compared to where the cows are turned out and graze for themselves; but the advantage of keeping the cows tied up during the hot summer days, in the economy of food, and in the steady supply of the milk, more than pays for this outlay. We now come to the question of the cows, and how to manage so as to get the largest output from the manufacturing. It is a question that bristles with difficulties, and is open to as many differences of opinion as there are tongues to express them. I have tried for some years to arrive at some definite conclusion, and I will only give a few results of tentative work carried out with this object in view. Of course the first point to be considered is, what is the object you wish to attain by keeping cows? Is it with the idea of keeping a fine herd, "pleasant to the eye and good for food"? Or do you want to utilise all the milk at home for cheese-making or butter-making and calf-rearing? Or do you want to sell your milk, where the greatest quantity you can grow means the greatest return in money? Because it depends upon what your object is as to what your course of procedure must be. Mine has been simply confined to selling milk, and, therefore, my remarks will only apply to this object. The first thing you have to contend against is the pleasant remarks of your friends who prefer beef to milk, the best milkers, as a rule, being those that carry the least flesh. The first system that I tried for several years was the common one of milking and breeding, but the results, as regards the annual return of milk, was not at all satisfactory; for, if you consider the time lost in the cows running over more than once, perhaps, from the bull, and the time lost when the cow has to be dried, from six weeks to two months before calving, and the reduction that takes place in the milk directly the calf gets to a certain size in the cow, I think I am within the mark in saying that you lose 25 per cent. in the yield of milk from these causes. There is another great drawback, that under this system you cannot keep up a steady and regular supply of milk; and you have also to keep two herds going—a dry herd and a milking herd—and this, of course, means either that your farm cannot be kept up to its greatest

return in milk, because of the necessity of keeping there dry cows, or you must have a second farm or a nursery to the first. Last year I changed this system by getting rid of the bulls and all the in-calf cows, and brought in down-calvers or cows in-milk, keeping them till the time when their yield of milk would only just pay the cost of their food. Then they were sold and replaced with new milched cows. With this result, that on one of the farms, where fifty cows were kept, the annual return of milk for the previous three years averaged 23,000 gallons annually; but the first six months after the change of system was carried out the return of milk exactly doubled itself. The quantity was, in round numbers, as much in the six months as in the yearly average of the previous three years. The cost of this increase was simply the difference between the sale price and the purchase price of the cows; the cost of feeding and labour in the case of a cow giving 30 lb. of milk a day—that of one only giving 10 lb., being practically the same. Now, if half the cows are changed every six months, and the difference in the purchase and sale price of the cows is 6*l.* a head, you find at the end of twelve months that the cost of changing the fifty cows has amounted to 300*l.*, and on the credit side of the balance-sheet will appear the increased yield of milk of 23,000 gallons as the result of this outlay; while if the selling price of this 23,000 gallons be taken at sixpence (6*d.*) a gallon only, it will amount to 575*l.*, leaving a very satisfactory margin for the expenditure. I have purposely taken the price of the milk at its lowest point, and have put the price between the purchase and the sale of the cows at as high a figure as I think is fair. Of course, this difference of price between the purchase and sale of the cows will vary according to the condition of the cows when they are sold, and whether you expend much money in feeding stuffs to get them fat, and sell them to the butcher. But at present prices there is no profit in feeding cows; so, whether you take the first loss of 6*l.* a head as the best, and let some one else feed, or whether you expend that 6*l.* in feeding the cow yourself, seems to me only a question of six of one and half-a-dozen of the other, so this question must be settled according to market prices and local circumstances.

13.—*The Care of Dairy Cows in Autumn.* By J. P. SHELDON.*

IT is a custom far too general, as it seems to me, to keep dairy cows out on the pastures and meadows, day and night as well, far too late in the autumn. Reasons for this are easily found,

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of course, but they do not appear to be always sound and solid. It is commonly supposed, for instance, when cows are once housed, even for the night only, and not for the day, that they at once and permanently fall off in yield of milk. If this were a fact, well and truly demonstrated by careful and repeated experiments, it would go far to explain, if not also to justify, the practice which is based upon it, at all events in part, of keeping cows extra-foraneous until the storms of winter begin to whirl about their heads. That cows fall off in yield of milk at this late period of the year is, no doubt, most true, when they are tied up in the shippons of nights, but it must be remembered that when they are only tied because the weather is too bitter for them to be left out any longer with safety, it is but natural that they will yield less milk, and that they would, in all probability, yield less, and still less, were they not tied and sheltered. As a matter of fact, in reference to cows that have been in-milk since March or April, the yield of milk is doomed to fall off, more or less, in October and November under any conditions that are usual, but it remains to be demonstrated that any additional falling-off occurs on account of the cows being housed. For my own part I doubt it, and my doubt is sustained, I believe, by experience. Much, of course, depends on the state of the weather, and almost as much on the food supplied to them; but, weather for weather and food for food, my belief is that cows will not fall off in milk simply because they lie dry and warm in the sheds, instead of wet and cold on the earth out of doors. A change of food and habit will, we know, affect the yield of milk, simply because a habit has been interfered with, but such a change as that alluded to is calculated to very shortly improve instead of diminishing the yield.

Another reason for leaving cows out late in the autumn lies in the belief that they will not pasture as well as in the daytime after they are once housed of nights. No doubt this is, to some extent, true; but so far as it happens to be true, it is owing to the fact of the cows receiving in the sheds a supply of dry or other food which, out of doors, they would not have had. Were they to receive this extra food at night while still out on the pastures, it would be found that, equally as in the other case, they would not pasture as well in the daytime; and by parity of reasoning we may say that if cows tied up of nights received no food in the sheds, just as, in fact, they do no eating out-of-doors in the night-time when frosts prevail, they would then pasture just as well in the day as if they had not been tied up at all. All the same it is true that cattle feel the chill of an early winter's day all the more when they are housed at night, and so will leave off eating early, and hang about the gates

waiting to be taken to the sheds. The best plan, therefore, is to feed them sparingly in the sheds, and to tie them up early in the evening, soon after they have left off pasturing. A little judicious management will easily regulate this sort of thing, and the cows may be induced to pasture well enough in the day-time, so long as the weather is tolerably genial.

I fancy, however, that one of the chief reasons why cattle are left out late on the pastures is the saving of trouble, as well as the saving of forage. Dairy farmers, especially in districts where the winters are long, naturally like to leave their hayricks alone as long as they can. "Once you begin with the hay-rick, you've got to go on with it," one often hears somebody say; and it is true, no doubt. It is also true that when cattle are housed, the trouble and labour with them begin at once, and continue till grass-day in the following spring. Habit, too, is strong, and to house one's cows is to close one custom and open another, to lay down one thing and take up another. There is no room to dispute the fact that cattle are least trouble when they are out-of-doors, and this is no doubt one reason why they are commonly kept there longer than they ought to be. And, further, winter seems to have actually set in, in earnest, when we find the cows in the sheds of a morning, warm and comfortable though they seem, chewing the cud of contentment.

But seasons vary so much, and everything turns on the weather. It is surprising how little effect even bitterly cold weather has on cattle that are used to being out-of-doors, so long as it is dry. It is damp, not cold, that kills, and this is why the intense cold of a Canadian winter is tolerable, and even enjoyable, for it is dry. In an autumn like the present, which is an uncommonly dry one for England, cattle are doing well out-of-doors, though sometimes there are keen frosts in the nights; but the land is dry, and the air too is dry, and, as a rule, there is plenty of grass; so that everything at present is going on "merrily as a marriage bell," forage is being saved, and winter postponed. It is not a general custom in the dairying districts I am acquainted with, at all events among cheese-making dairy farmers, to give dairy cows any dry food—either in the form of cake, or corn, or hay—until they are housed for the nights; and I think it is a mistake. Milk-selling farmers treat their cattle better than this—feed them more generously, house them earlier in the autumn, and so on. Their object, of course, is to produce a full supply of milk at a period when it is becoming scarcer, and so greater care is taken of the cows; but cheese-making farmers consider that the season is over for cheese, whereas for the milk-trade it is perennial and unceasing.

Cattle seldom take much harm so long as their backs are dry.

Frosts do not hurt them much, if the air is dry, and there is no snow or rain to follow. An autumn with chilling rains and a sodden atmosphere, varied by frosty nights and an occasional flickering of snow, cause them not only to fall off in milk, but to lose flesh rapidly. The period for housing them should be governed by the character of the season rather than the time of the year. But whatever the character of the season may be, I believe it is sound economy and paying practice to give cows a little cake or corn, beginning early enough in the autumn. And I prefer dry food in a concentrated form at this period of the year, for the grass and other green food is bulky enough. And by using cake instead of hay, the stomach is not filled, and the cows are compelled to pasture freely to fill it. Cake, I think—a mixture of linseed and rough cotton-cake, or the latter alone on land that scours—is preferable to any other form of corn, for it is handier, and serves your purpose admirably. Where cows are milked in the sheds they may, with advantage, receive a feed of chaff and corn; with this I have no fault to find, only I prefer cake. My chief contention is that dairy cows should have something more than grass and green crops at the fall of the leaf, and I have no particular wish to advocate one kind of corn to the exclusion of others. Judiciously supplied, cake and corn will pay in dairy cows in the fall of the year, even when the milking season is drawing to a close.

14.—*Butter-making by Machinery.* Report of a Visit to the Glynde Dairy Factory, in June 1888.*

ABOUT a year ago Lord Hampden established a dairy factory on his estate at Glynde, near Lewes, for the benefit of his tenants and other farmers of the district. The intention was to form a company to work it; but some difficulties having arisen, Lord Hampden decided to make the start on his own account, with the idea of forming a company later on, in the event of the venture proving successful and needing to be extended. An ordinary cattle-shed was transformed into a factory at a comparatively small expense, and, although not exactly an ornamental structure, has served the purpose for a time, but is now being enlarged as well as improved, to allow of an increased quantity of milk being dealt with.

On the occasion of my visit, arranged beforehand with Viscount Hampden, his lordship was, unfortunately, called away unexpectedly, and I was disappointed at not having the

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pleasure of meeting a nobleman whose efforts to improve the position of his tenants and labourers are well known. The manager of the factory, Mr. F. Mayger, however, very courteously showed me all that there was to be seen, and gave me all possible information, answering all questions without reserve. One thing I was not able to obtain—a balance-sheet of the business, that being only now in course of preparation. It is scarcely to be expected that a profit will be made on the first year's working, but it is important to know whether there is a prospect of profit. Judging from the prices obtained for the produce of the factory, I am disposed to expect it to pay well. At any rate, it is to be hoped that it will pay, because it is of great advantage to the tenants on the estate and other farmers in the district. This will be obvious to all readers when I state that the price paid for milk was 9*d.* per imperial gallon during the winter months—fully half the year, I believe —while recently 7*d.* per gallon has been paid for Shorthorn and 8*d.* for Jersey milk. Some extra milk, which Lord Hampden had been urged to take at any price, is not so liberally paid for, because until the factory has been enlarged it is an inconvenience to have more than the regular quantity—about 800 gallons a day. But 7*d.* and 8*d.* are good prices to be paid at Glynde, at a time when a good deal of milk is being sold in London at 6*d.* or less. When the alterations are finished the factory will be capable of dealing with 2000 gallons per day. About 2000 lb. of butter per week have been made lately, and sold at good prices. For six months up to the end of March the price obtained was 1*s.* 6*d.* per lb., and it was 1*s.* 4*d.* up to the end of May, while since it has been 1*s.* 2*d.*, at which price buyers are willing to take any quantity that can be turned out.

Mr. Mayger, the manager, was trained in Lord Vernon's factory. The head dairymaid, Miss Rush, was for some time with Professor Carroll at Glasnevin. The butter made on the occasion of my visit was excellent, and I understand that it is regularly good.

There are two Danish separators in the factory, each of which will deal with 100 gallons of milk per hour in warm weather, and about one-third less in cold weather. A much larger separator of the same kind is ordered. The churn, worked by steam like the rest of the machinery, is a Bradford's diaphragm, which will churn thirty gallons of cream at a time; but a larger churn is ordered. In cool weather a Delaiteuse is used. One of Bradford's butter-makers was in use on the occasion of my visit, and the butter, taken out of the churn in granules, of course, was salted with dry salt on the worker.

The temperature at which the cream was churned was 60 degrees Fahr. During the winter months 1 lb. of butter was produced from 2¼ to 2⅓ gallons of milk, but it is to be borne in mind that a good many of the cows on Lord Hampden's estate and some on his tenants' farms are Jerseys. One of Mr. Jasper Stephenson's sample churns is used for testing the milk. Hot and cold water and steam are available all over the factory, and outside there is a capital arrangement for using water and steam in cleaning the cans in which milk is brought to the factory.

There is no difficulty in getting rid of the separated milk, about 3*d.* per gallon net at the factory being obtained for it. Most of it is sent to Lewes, Hastings, Eastbourne, Brighton, and Tunbridge Wells, and only a little to London. That sent to London pays least. The people of the Glynde district have all they like at a penny a quart, while for new milk they are charged 4*d.* Lord Hampden is anxious to have the separated milk sold at a reasonable price in the towns, and for that reason he makes an arrangement which is not of a rigidly commercial character. Dealers who retail at 2*d.* a quart get their milk delivered at a price (about 4*d.* a gallon usually) which leaves 3*d.* net; but if they sell at 1½*d.* a quart they pay less—about a halfpenny less. In winter the price at the factory is 3½*d.* a gallon. The average net price for the year is fully 3*d.*, I understand, which is satisfactory. The separated milk is scalded at a temperature of 160 degrees, one of Lawrence's scalders being used. It is then cooled down to 60 degrees before being sent away.

The jug cream-trade is being started at the factory. Neat little half-pint and quarter-pint jugs, corked down and covered with silver paper, are sent out. The thick cream is intended to be retailed at 6*d.*, and thin at 5*d.* a quarter-pint. Jugs, corks, silver paper, carriage, and agent's commission take about half, leaving 3*d.* a quarter-pint for the thick cream. This, of course, pays better than butter-making, if a regular demand can be met with for a large quantity; but there is a good deal of work and trouble in this branch of the business.

Lord Hampden has a herd of Shorthorns and another of Jerseys. Unfortunately, on the occasion of my visit, they were grazing on a distant part of the home farm, and I had not time to go and inspect them. A good many of the Jerseys were imported from the Island.

I left the factory heartily wishing success to an undertaking carried on under circumstances so beneficial to all concerned in it; and from what I saw of the management and the work, I have every reason to trust that success will be realised. A dairy factory in the hands of an ordinary middle-man, whose

only object is to buy in the cheapest market and sell in the dearest, is, in my opinion, a source of injury to dairy farmers; but Lord Hampden's undertaking is of a very different character, for he desires only bank interest on his capital, and he may be trusted to pay his tenants as much for their milk as he can afford to give without being a loser.

15.—*A Devonshire Home Farm.* By "H. E."*

THE Home Farm of Sir J. H. Heathcote-Amory, Bart., Knightshayes Court, near Tiverton, was recently visited by a writer in the 'Field,' who supplies the following account, slightly abridged.

After complimenting the management of Mr. Greenslade, the steward, the writer proceeds as follows:—"The grass land—some of it in water meadow—lies in the valley of the Exe, two miles above Tiverton; and in recent years it has spread and extended further up the slope, where I saw some capital young pasture which was laid down last spring. The upper levels are kept in arable, or in temporary pasture, which is laid down for two or three years. In the course of my note-taking on the farm with the steward, he informed me that the 270 acres of pasture are good, and the 250 acres of arable 'plain.' But, plain as it may be, the crops upon it this year were good, especially the oats. It follows, therefore, that the land must have been heavily manured, and, as the expense of manuring poor land depends on the profit or loss of the stock that is kept upon it, we may conclude that the stock-keeping of this farm is adapted to the land —*i.e.*, that the right breeds of sheep and cattle are maintained, and that they are skilfully managed. These are the points which I shall endeavour to make prominent.

"BUILDINGS.—At the principal homestead these are quite new, and so entirely appropriate, that wealthy proprietors could not do better than copy them, contrived as they were by a practical man. There is nothing extravagant about these buildings, and yet they include everything necessary to the well-being of the stock, to economy in feeding them, and to the preservation of the manure. We should always look with an inquiring eye upon that part of the premises where the machinery is collected and the food mixed and distributed. The arrangements at Knightshayes are excellent. A 6-horse power portable steam-engine drives the machinery, including a threshing-machine, chaff-cutter and mill. There is a mixing floor, where food is

* Reprinted from the 'Field,' September 22nd, 1888.

prepared for easy conveyance into the adjoining cattle houses. The buildings are placed on slanting ground, and the roots, stored outside, are shot through a window into the root store, which is a room adjoining the mixing floor. Here they are cleaned and cut. Every head of stock is supplied with water from a reservoir, which in this land of streams and springs is never dry. Instead of the rich manure passing daily into an open yard to be washed and impoverished, it is preserved in convenient covered manure heaps, and no doubt the good crops are partly due to this care. The stables are good, if not sumptuous; they consist of stalls, not of boxes. There is a harness room, and there is also a carpenter's shop, a convenient piggery, and a slaughterhouse, and in the rear of the capital farmhouse there is a store for cider. I do not propose to describe here the cultivation of orchards and the making of cider; but, as this branch of the business affects the returns, it is necessary to state that a common crop of this district—the apple—is grown on thirty acres of the best land, its average yield being four hundred hogsheads of cider or more. If you wish to bribe a farm labourer at hay-time, or any other time, give him cider or beer. In this part of the country he is titillated with the former beverage, and this practice must affect returns, cider being the cheaper of the two, its usual price not exceeding 5*d.* per gallon. The labour bill, therefore, is reduced by the consumption of a home-grown beverage. And here one may remark upon the surprising circumstance that, while farmers have had to succumb to their ill-fortune during the distress, their labourers, in all but the cider districts, should have remained large consumers of beer, while the old orchards of Surrey, Sussex, Herts, Berks, and other counties have fallen into decay.

"*Cropping.*—The arable land consists now of 250 acres. It has till lately been 152 acres only, and these have been cropped as follows: 40 acres of oats, 20 acres of wheat, 15 acres of barley, 20 acres of swedes, 25 acres of turnips, 12 acres of mangold, 18 acres of 'seeds,' and 2 acres of cabbages. Three or four acres of the corn land are every year sown with trifolium, and 14 acres with vetches. Both these forage crops are followed by turnips. The dressing for common turnips is 6 cwt. per acre of dissolved bones; for swedes, the same, with 2 cwt. of guano; and for mangold, the same, with dung in addition, and with 5 cwt. of salt per acre. The turnip and swedes are folded by the fatting tegs or hoggets.

"*Live Stock.*—We now come to the main feature of the system; which is to fatten for sale the whole of the home-bred stock. This consisted, at the time of my visit, of 100 very

superior Devon cattle, including 20 milch cows, whose produce are reared, and 200 ewes with their progeny. In addition, about twenty bullocks are purchased in the spring, and finished off the grass the same year. The value of the cake and corn consumed on the farm annually is about 600*l.* This is not an enormous quantity for so large a farm; and it is quite possible that some managers would use more, and by so doing convert, perhaps, a profit into a loss. The calves—to begin at the beginning—suck their mothers until they are eight or ten weeks old, by which time they have learned to eat cake and corn. Having been calved in the winter—generally from November to January—they are fed in spring on trifolium and other forage crops; but they are not forced or extravagantly fed either before the forage crops come, or afterwards. High feeding would, in fact, be exceedingly injudicious, since they are to be summered on the pastures without corn. It is possible that some persons in Mr. Greenslade's position would go in for early maturity. Having good pastures to rely upon, he wisely prefers bringing out the bullocks at from two to three years old. He fattens all the cattle at that age, except the draught cows, which are, of course, much older. In their second winter, at a year old, the young things are fed on mangolds and hay. Turnips are avoided, as they are suspected of having been the cause of the fatal disease called black-leg. Heifers and steers are now separated, and the latter get a little cake. They are turned on the pastures in May for their second summer, and on the best grass get no cake, though in a year of drought like last year all ordinary rules had to be abandoned, and a very large expenditure was incurred in the endeavour to keep the stock in fair condition. They are fattened off the grass in their third summer at about two years and eight months old.

"It should be stated that the Devons are all pedigree stock, though none are now exhibited from the herd except at the Birmingham and London fat cattle shows, where they have been prize winners. They are as useful as they are beautiful, and there can be no doubt that the good returns of this successful home farm are largely due to the excellence of the stock. Lord Don, a three-year-old bull, now in use, traces back to Mr. Quartly's 'Hundred Guinea.' He is an animal of wonderful depth and weight; and, as I was presented to him out of doors, quite in the open—which is the fashion in Devonshire—liked him none the worse for his gentle disposition. Nothing could exceed the beauty of ten in-calf heifers by Lord Allerton, of thirteen yearlings, all on the pasture, and doing remarkably well on grass only. Thirteen cows, in calf by Lord Don,

were perfect in shape, and good for producing superior beef and rich butter. These facts show the quality of the herd. Beef is made fast by animals of such character; and there is not the slightest doubt that a pure herd of hardy and rent-paying Devons is favourable to the profitable management of the farm. I cannot say the same of the trees in the park. I have rarely seen a park more beautifully timbered with all sorts of trees, whose tall magnificent habit shows the excellence both of soil and subsoil. But, of course, they lessen the feed considerably, and injure the quality of the grass. The best of the pasture, therefore, is somewhat removed from the mansion, in whose precincts ornament is naturally the main consideration. About 100 acres have been laid down in permanent pasture during the twenty years that the present steward has held his post, and he is still adding some heavy arable land to that already in grass. Last April 8 acres, after roots, were sown with a good mixture of grasses with rape. The rape was folded and the grasses are luxuriant.

"The lambs are dropped in February and March, and they get no cake on the grass. They are folded in turnips from November till February, when they get cake and oats, and go to the butcher in the last-named month, weighing on an average 9 st. each. Heavier weights, but not perhaps so much profit, might readily be obtained with a little more forcing. An annual ram sale of about twenty rams is held in July, and 10*l.* per head average for some years past has been thought satisfactory. The flock of Devon Longwools is a very prominent one, having won more prizes than all the other flocks of the same breed combined. Their fame is provincial, but they may claim to be the favourite breed of three counties—Devon, Somerset, and Cornwall, in each of which profitable farming is not entirely a thing of the past. The washed fleeces of the whole flock average 9 lb. each.

"The wages are liberal on this farm. Carters get 12*s.* per week, with house and garden and fire-wood free, and a gift of two quarts of cider a day. The shepherd gets 14*s.* and similar privileges; two herdsmen, 11*s.* and 12*s.* respectively, and the same privileges; and day men, 10*s.* and house and garden, with the cutting of the corn and hoeing turnips by task, and as much cider in hay-time as thought requisite. Fourteen men perform the labour of the farm. The cottages, partly situated in the hamlet of Bolham, close to the home farm, and partly scattered, are exceedingly substantial and comfortable, with good gardens, and many a shrub and tender flower, in proof of the genial Devonshire climate. The roads and fences, too, are all good. The horses are a good country-bred sort; and several foals are

produced yearly—the offspring of first-class sires. To conclude, the success of this farm is probably due mainly to the excellence of the live stock, to their skilful management, and to the economy of permanent pastures."

16.—*Apples for Profit.* By Mr. GEORGE BUNYARD, Maidstone.*

THE commercial growth of apples for market is frequently entered upon in a wrong manner, because many start into the enterprise without sound information. Beginners fight shy of the growers of trees for sale under the unfair notion that they would recommend those kinds of which they held a stock; they then procure the "tip" from the salesmen in the various markets, who, as far as they can (and in good faith), give them the names of the kinds that sell well; fruits, so to speak, which dispose of themselves by their names or appearance. Many of the choicest apples produce but a small crop, or are so long in coming to a state of profitable production that planters get discouraged; others are recommended which are very slow growers, or rarely make good orchard trees, and thus land is not fully utilised. As the markets are supplied from a large area, the salesmen have but a general idea of the suitability of sorts to a district, and hence much valuable time is lost. In the short time at my disposal, I propose to give a few hints as to the formation of a profitable apple orchard or plantation, where the return shall be speedy, and yet in the future, for a century, shall promise a good result. The first operation is the procuring of suitable land.

In a district where little fruit is grown, an idea can be gained from the growth of the few fruit trees in the cottage gardens, and perhaps the orchards near gentlemen's seats. If the apples show a kindly and clean growth, with an absence of lichens and canker, and if elm-trees flourish, it will so far be favourable. Exposure to prevailing winds is to be avoided, either by shelter-planting, or, better still, by taking advantage of existing woods or hedges; and a slope to the south or west is to be preferred, but in order to secure a permanent orchard, care must be taken to get deeply cultivated, or rich, deep soil, or a few years of fertility will only be the precursor of decay and disappointment.

Having settled on suitable land, the tenant or purchaser next proceeds to put the land in order for planting, either by steam cultivation, or by thorough digging or trenching—the latter, though expensive at the start, is of permanent benefit. This

* A paper read at the Chiswick Fruit Exhibition, October, 1888.

operation is best done before the frosts set in, that the land may be purified and sweetened by exposure. The ground should then be set out, and standard trees, on the crab or free stock, of the following sorts, planted 24 feet apart, requiring 75 to an acre:—

Apples for Standards on Warm Loamy Soils.

1. *Desserts to Pick and Sell from the Tree.*—August: Devon Quarrenden, Sugar-loaf Pippin. September: Lady Sudeley, Yellow Ingestrie.

2. *To Store from October to Christmas.*—King of Pippins, Mabbott's Pearmain, Cox's Orange, Blenheim Orange.

3. *Kitchen Apples to Sell from the Tree in August and September.*—Early Julien, Keswick Codlin, Lord Suffield, Duchess of Oldenburg, Councillor, Grenadier (true), Ecklinville.

4. *To Store from October to December.* — Warner's King, Schoolmaster, Lord Derby, Golden Noble, Tower of Glamis, Waltham Abbey.

5. *To Keep from January to May.* — Wellington Winter Queening, Norfolk Beaufin, Lady Henniker, Bramley's Seeding, Annie Elizabeth.

If the soil is cold but rich, omit Suffield, and add Lord Grosvenor, and omit Cox's Orange and King of Pippins.

So far for the top crop, the space between being utilised by placing three two or three year old dwarf trees between each standard, others at 6 feet apart, which, less 75 for standards, will be 1135 per acre, until the plantation is filled up. These dwarfs will produce the best fruit from trees on the Paradise or surface rooting stock, and may consist of the following:—

Apples for Bush or Free Pyramidal Style to be Grown on Paradise Stock.

6. *Dessert Kinds to Sell from the Tree.*—(7.) Early: Gladstone, Red Juneating. September: Colonel Vaughan, Duchess Favourite, Worcester Pearmain, Duchess of Oldenburg, Yellow Ingestrie.

(8.) *To Store for Sale from October to February.*—Cox's Orange, Cox's Pomona, Peasgood's Nonsuch, Gascoyne's Scarlet, Beauty of Kent, Baumann's Reinette.

If the soil is cold, omit Cox's Orange and Worcesters, but if very rich and good warm land, add Adams' and Hubbard's Pearmains, Rossa, Nonpareil, and Gipsy King; while for very late keeping, Golden Knob, Sturmer, and smaller fruit of Mignonne are useful.

(9.) *Kitchen Apples of Large Size to Sell from the Tree (on dwarfs).*—Lord Grosvenor, Ecklinville, Manx Codlin, Golden

Spire, Pott's Seedling, Stirling Castle, The Queen, Small's Admirable, Grenadier, Councillor, Stone's.

(10.) *Fine Kitchen Apples to store (on dwarfs).*—Lord Derby, Murfitt's Seedling, Winter Peach, Lane's Prince Albert, Dutch Mignonne, Bismarck.

In six years' time the trees immediately beneath the standards can be transferred to other land, and will, if removed with care (in October or early in November), suffer little from lifting, and in the second year will produce heavy crops. After the sixth season the orchard should be left with a permanent crop of dwarf apples and standards at 12 feet apart. The dwarfs at some future time could be cut away, and the standards, which would then be established and strong, should be laid to grass, and thus fodder for sheep keep and a top crop of apples could be secured annually. Until the 6-feet trees cover the land potatoes may be grown between the rows, or Lily of the Valley, or Daffodils. But if land is cheap the space may remain without crop, and the roots will benefit greatly from the run of all the land. Weeds must be kept down, and if standards only are planted, no corn crop must be taken ; but in this case soft fruit may be placed between them. The plantation should be dug in December or January each year, and be knocked over with a prong hoe in March.

Oxen and horses should not be allowed in young orchards. Shelter can be quickly obtained by planting damson or bush plums (the latter a Kent sort) with Crawford or Hessle pears as an inner line at 12 feet apart, and this screen would pay its way. If desired, plums could be placed between the apple standards and gooseberries and currants, omitting the dwarf apples. If the land is properly prepared the apples should need no manure for some years, as the use of stimulants while the trees are young is prejudicial by inducing a sappy unripened growth which lays the tree open to damage by frost. When the trees are carrying a heavy crop, mulching may be carried out in June, or liquid manure can be used with advantage in the growing time. Such a plantation as described would commence to bring a return from the dwarfs in two years, and the fruit with a little care in thinning would command a ready sale, because, when growing in this manner, it is cleaner in appearance and much larger in size. In three or four years the standards would commence to fruit, and a much larger return would annually be made ; and if properly managed, at the end of fourteen years, the crop would buy the fee-simple of the land outright.

In order to make the highest price, all fruits should be "graded" as the Americans say, and be of an even sample

throughout, be properly named, and packed carefully, so that the baskets open clean and bright at the market. In the case of choice dessert kinds it would probably pay to pack them in light card boxes, such as those introduced by Mr. Tallerman for cherries, &c. and manufactured by Messrs. Johnson. In fact, we should take a leaf out of the French books, and put up our produce in an attractive form.

The pruning of the apples in February or March is of the simplest; no apples should be pruned the first year of planting; for the first two years commence to form the standard trees by taking out all the inner wood to attain a bowl shape, and cut back the young growth to four or six eyes, to a bud pointing outward. The fourth or fifth year shorten the wood of the current year to 6 or 12 inches, and keep the centres clear, and after that time let them grow as they like, merely shortening the tips to procure an evenly balanced head, and taking out any crossing pieces of growth. The dwarf can be cut-in to form pyramids or basins, as desired, for two years, and after that be allowed to grow freely. Other matters, such as securing the limbs in a heavy crop, and staking the standards, will have to be attended to, and the stakes must be removed from the standards in the winter as soon as the trees can do without support, as the ties are apt to cut into the bark and produce canker.

For apple-growing land need not be contiguous to a railway station, as they will travel well if carefully packed. Storing enables a grower to realise a high price at a time when good apples are scarce; where proper stores, such as the hop oasts of Kent, do not exist, a frost-proof shed will do; and if care is taken to store all sound fruit, a thick covering of straw will effectually exclude frost, and keep the fruit plump and heavy. If 1100 trees bore half a gallon each, at three years old the crop would be about 70 bushels per acre, which, at 4*s.* nett (carriage and salesman's charges deducted), would give a return of 14*l.* per acre; at five years 1 gallon each would double the produce; and so on. When the top and bottom crop come to pick, an average of half a bushel per tree would give a return of about 120*l.* per acre. The risk of loss by wind is small with dwarf trees, and the cost of picking is less than in tall trees, and they can be readily thinned and attended to.

A word as to old existing orchards. My recommendation is, "Woodman, spare that tree." If such old trees are well manured, in two years they would be either producing good fruit, or, if cider apples, they would so benefit from the improved culture that they should pay for re-grafting with superior kinds. I believe much may be done in this way, as the roots soon

respond to generous treatment, and the foundation of success rests upon them. Suitable kinds for grafting on old trees would be:—Stone's, Lane's Prince Albert, Small's Admirable, the new and splendid Bismarck; or the smaller dessert apples, such as Duchess Favourite and Yellow Ingestrie.

The list of fruits given is more extended than is advisable, but it may only be possible to obtain a part of the sorts given in the planter's locality; the fewer kinds used the better.—*Reprinted from the 'Gardener's Chronicle.'*

17.—*Fruit Culture for Profit.* By Mr. T. FRANCIS RIVERS, Sawbridgeworth.*

OUR meeting to-day is, I hope, the first of a series of meetings on the very important subject of fruit culture in England for profit. Within the last few years a very great advance has been made in this direction by the force of circumstances, and not by the speeches of any one man, however eminent. When wheat was worth from 40*s.* to 60*s.* per quarter there was no need to apply the resources of the land to any other purpose, as the price of wheat governed the price of produce, and was amply sufficient to support the different interests depending on the land. We have now, however, to face an altered condition of affairs. The land is with us, and is as productive as ever, but the consumer no longer pays the price required by the English producer; and although it is absurd to suppose that corn is not still the ruling crop, yet all cultivators are forced by circumstances to consider whether they cannot be assisted by other crops. One of these helps or aids is undoubtedly the cultivation of fruit, which is of daily consumption, and is, or ought to be, on the table of every individual in the United Kingdom. We have, therefore, to deal with a very large subject —nothing less than a national industry, and an increasing one, the development of which enters into conflict with no British interest, treads on no man's toes, is strictly non-political, will suffer no decay but improve as the years roll on, and in which succeeding generations are quite as much interested as we are, and is a pursuit from first to last which never wearies. A man between seventy and eighty can make the superintendence of orchards both his pleasure and employment.

We have not, I think, in England held enough meetings of this kind; they are frequent enough in the United States, where fruit is an important factor in national life, and takes

* A paper read at the Conference of Fruit Growers, held at the Crystal Palace September 7th, 1888.

rank with the most advanced agriculture. In Belgium, a country which profits largely from the exportation of fruit, pomological congresses are constantly held. I have attended several, my first introduction to Belgian pomologists being at Namur in 1862, when the hospitality of the town was profuse and splendid. There can be little doubt that these meetings are of great public utility, and now that we are entering the lists and preparing to meet an enormous and increasing domestic want, it does not become a great and wealthy country like England to be anywhere but first in the race. Our climate is good, our soil so varied that we can find land for all ordinary crops. Although we are subject to cold and late springs, yet we do not suffer from the extremes of heat and cold to which great continents are subject, storms which destroy the fruit, and cold which will destroy the trees. Neither is it so equable that fruit trees are exhausted by continual bearing—a condition under which eight to ten years would be the term of the natural life of the tree—conditions which would, no doubt, be satisfactory to the fruit tree grower, but with the inevitable result of the supply overtaking the demand, and of the usual disastrous consequence. Of this, however, we need have no fear. We must, in order to secure early profits from a garden orchard such as I propose, plant on a different principle to that of our forefathers, who have bequeathed the hoary and lichen-covered trees dear to the artist and fruit-loving boys and girls. These picturesque old trees are as much things of the past as our wooden three-deckers; and instead of the acre of grassland with the customary 108 trees, often broken down by stock, and producing more wood than fruit, the modern fruit orchard must be condensed into a compact compass, give more fruit in 1 rood of land than in 2 or 3 acres of the old-fashioned style.

Soil.—The most important part of the preparation of an orchard is, of course, the quality of the soil, and the intending planter should not hesitate to spend a few shillings in obtaining an analysis. I attribute a great part of my success in fruit growing to the nature and qualities of the soil. An analysis made by Dr. Voelcker for Mr. Prout, of Sawbridgeworth, gives the following constituents of the land on his farm, mine being the same formation, and closely identical. The quantities are contained in a depth of 6 inches per acre:—

Phosphoric acid ..	2½ tons.	Sulphuric acid ..	2½ tons.
Potash	5½ „	Nitric acid	22 lb.
Lime	37 „	Nitrogen	1 ton.
Magnesia	4½ „		

I shall show presently by an analysis of fruit that the inherent qualities of this soil are vastly favourable for certain

classes of fruit; and if the depth, instead of 6 inches, is extended to 20 inches, to which the roots of fruit trees will reach in searching for food, the aliment afforded is of inexhaustible amount. With our present knowledge of artificial manures all deficiences in other soils may, however, be easily supplied; but I hope that you will agree with me that an analysis of the soil is indispensable, and that it is necessary not to judge only by appearance, but to gain an intimate knowledge of the soil constituents. A deep rich loam is sometimes misleading, and trees, though apparently vigorous at first, being deprived of their requisite food, will become cankered and stag-headed. The cultivator must make it his business to cure this defect, which an elementary knowledge of chemistry and of the application of chemical manures will enable him to do. The position of the orchard is another important point. It is, I think, well known that frosts are more severe in low-lying lands near rivers, and fruit trees should consequently be planted above the line indicated by the rising mists.

The preparation of the soil is the next point, and I will assume that a man with 100 acres of land can afford to devote 1 rood for the cultivation of an orchard; this must be fenced with wire-netting high enough to keep out hares and rabbits during snow, as one night's visitation of these animals would suffice to destroy the growth of years and to ruin the plantation. In my own case I have sunk a barbed wire to prevent burrowing. Wire-netting is so cheap that this expense is not great, and with proper care it will last for years. At all events, it must be incurred; for although rabbits may be utterly destroyed, hares will travel for miles in search of food. In Belgium, in the fruit-growing districts, they are altogether absent, but it is not likely that this will ever be the case in England. The land, if at all infested with twitch, should have a summer's fallow to eradicate the pest, as it cannot be easily destroyed when the trees are planted. It will grow amongst the roots, and is then most difficult to deal with. As early in September or October as practicable the rood of land, having been previously lressed with 12 to 15 tons of good farmyard manure, should be renched to the depth of 24 inches, the top soil being kept at he top, and the bottom broken up and turned over. I am con-nced that this costs about 1*s.* 6*d.* per square rod, or 3*l.* for rood, according to the tenacity of the soil, and is absolutely essary, as I have found from experience that my plantations in a soil which has been frequently trenched bear more bundantly, and give finer fruit, and are more healthy than hose which I have planted in holes only without moving the urrounding soil. The rood of land trenched and fenced will

be ready for the reception of the trees in November, the soil being pulverised and settled. Considerable expense having been incurred, I propose to show that the planter will be able to recoup himself by the number of trees he can plant and the consequent produce. The rood of land will accommodate about 400 trees—that is, 200 trees planted 9 feet apart row from row and 6 feet apart in the rows of plums, apples, and pears, and 200 bushes of currants and gooseberries between at 6 feet apart in the rows. The rood, therefore, will contain as many apples and plums as 2 acres of the ordinary farm orchard, and enough bush fruits to pay all rent and expenses, and will be protected from all injury from stock and game, and without such protection it is useless to plant.

Plums.—In my own district the plum is the most valuable fruit I have, and it is not difficult to explain the reason of this superiority. The plum, according to an analysis drawn out by Mr. Edmund Tonks, of Birmingham, contains:—

59·21 potash.	15·10 phosphorus.
10·00 lime.	3·83 sulphur.
5·46 magnesia.	2·36 silicon.
3·30 iron.	

All of which constituents are largely present in my soil. It is one of the most valuable fruits of our domestic economy; it makes a delicious and nutritious preserve, and during the months of July, August, September, October, and even in November, it may be present daily on the dinner table either cooked or uncooked, and I believe that certain classes of the Germans almost exist on the fruit, such are its nourishing qualities. The sort which I plant the most extensively is the Early Rivers or Early Prolific; this was raised by my father some fifty years since, and in the most disastrous seasons I have never known it completely fail. I believe this immunity to be owing to the fact that from its precocity (as I have known the whole crop gathered by the 5th of August) the tree has time to recover its strength in the period of nearly eight months which elapses between the gathering and the next season's blooming. The density of the fruit is very great, as it weighs 70 lbs. to the bushel. This is against the producer, as it ought to be sold by weight. I believe that as a dead fruit it will fully equal the dried French plums. Close to the gathering of the Early Prolific I have the Czar, a large purple blue plum of abundant fertility; then the Sultan, and at the end of September Prince Engelbert and Pond's Seedling; and beginning of October the Monarch, Archduke, and Grand Duke. I have discarded the Diamond, Reine Claude de Bavay, Reine Claude d'Oullins, Belgian Purple, as too uncertain for market plums.

For the farm orchard the interval between the Sultan and Pond's Seedlings should be filled up by the Victoria, Green Gage, Gisborne's, and the Pershore, all of which are well-known market plums, and are equally suitable for cooking, preserving, and drying, and I hope one day to see the grocers' shops continually supplied with these plums of British manufacture. The Cluster Damson, well known for its enormous fertility; the Prune, and Shropshire Damsons are also very important fruits which should find a place. The sort of tree to be planted should be what are usually called two or three years' unpruned standards, the younger the better, as the transplanting causes little injury to young trees. I may here mention that the Early Rivers does not prosper in my soil when grafted on the Mussel stock. The future health of a plantation depends very much on the stocks used, and it is therefore necessary to be particular on this head.

Apples.—The fruit which stands most in national importance is of course the apple, and it seems strange that we should allow foreign nations to usurp our position in the supply of this very necessary want. In the 200 trees required for the rood I should apportion 100 apple trees, and for a continual supply of culinary fruit Keswick Codlin, Duchess of Oldenburg, Lord Suffield, Stirling Castle, Worcester Pearmain, Manx Codlin, Ecklinville Seedling, Lord Grosvenor, Warner's King, Blenheim Orange, Baxter's Pearmain, Lady Henniker, Tower of Glamis, Betty Geeson, Dumelow's Seedling, will last from August to the end of April; of dessert apples, Red Juneating, Irish Peach, Summer Golden Pippin, Devonshire Quarrenden, Williams' Favourite, Ribston Pippin, Cox's Orange Pippin, King of the Pippins, Blenheim Orange, Mannington's Pearmain, Lord Burghley, Sturmer Pippin, Allen's Everlasting, will give a supply from June to May. On the Paradise stock all these apples will form fruitful and profitable bushes, and are all marketable apples, and in my opinion are very much better than any Baldwins or Newtown Pippins. Some of these kinds, such as the Manx Codlin and Stirling Castle, can be planted 6 feet apart. Worked on the Crab stock, they are so fertile that they are soon dwarfed by the production of fruit. As with plums, I should recommend trees two or three years old being planted. Of apples of recent introduction I have not found Mr. Gladstone so good as it was represented. It is not earlier than the Juneating, is very unequal in size, and has the unpleasant habit of being in a constant perspiration. Lady Henniker is a large and fine apple. Peasegood's Nonsuch is very handsome and large, but does not bear so freely in my soil as the apples I have named. The stock English apple, the

Blenheim Pippin, is a long time coming into bearing, but when fruitful always commands a high price; this and the Dumelow's Seedling would, no doubt, be valuable for cutting into chips and rings.

The analysis of the apple differs from the plum. There are present:—

Potash	35·68	Iron	1·40
Soda	26·09	Phosphorus	13·59
Lime	4·08	Sulphur	6·09
Magnesia	8·75	Silica	4·32

Pears.—The pear is the next in rank as an industrial fruit, but it by no means equals the apple or the plum in importance; indeed, during a great part of the year it is seen only on the tables of the wealthy. I have, however, had a considerable experience of pears as standard trees. Within my recollection I have seen planted and destroyed the following sorts:—Summer Bergamot, Lammas, Passans du Portugal, Windsor, Williams' Bon Chrétien, Dunmore, B. d'Amanlis, Marie Louise, Louise Bonne of Jersey, Winter Crassanne, Beurré de Cepiaumont, Beurré Bose, Comte de Lamy, Hessle, and Spring Beurré, none of which ever paid the rent of the ground they occupied. I have, however, raised three sorts of pears which will reverse this position. These are the Beacon, ripening the end of August and beginning of September, which is so fertile that, grafted on the pear stock, it may be planted at the same distance as the plum and the apple; the Fertility, which is equally fertile either on the pear or quince, and the Conference, which is not yet introduced to the public. The two former are already well known. Of recent foreign pears which are hardy, Madame Treyve, Souvenir du Congrès, Marie Louise d'Uccle, and Emile d'Heyst are marketable sorts; of baking pears the Catillac is probably the best. The pear differs in analysis from the plum and apple. It contains:—

Potash	54·69	Iron	1·04
Soda	8·52	Phosphorus	15·20
Lime	7·98	Sulphur	5·69
Magnesia	5·22	Silicon	1·49

The best class of tree for planting is the two and three years old on the quince stock, excepting the Souvenir du Congrès and the Beacon, which should either be double grafted or on the pear stock.

The Morello cherry on the Mahaleb stock makes a very prolific bush. Grown in this way or trained to iron wires, it may be easily protected with netting. Between the rows of pyramid or half-standard trees, currants and gooseberries can be

planted without in any degree injuring their produce, care being taken to return to the soil by chemical manure the constituents of which it is deprived by the growth and fruitfulness of the trees. By attention and occasional analysis there will be no more difficulty in doing this than in providing for the ordinary farm crops.

Pruning.—In a farm orchard it is not necessary to prune trees severely. Pears and apples in unfruitful seasons should have the shoots stopped in June, and should be occasionally examined and the inner growth lightened to let in the sun and air. About the end of September the shoot made after the first pruning should be shortened to four or five buds. As soon as the trees are fruitful very little pruning is required. Plum trees require as little pruning as possible, but all gross shoots should be removed when observed. The sorts of plum I have named fruit so early that they do not grow into very large trees. In these garden orchards it is not well to allow the trees to grow to more than 10 to 12 feet. Avoid the use of long ladders as much as possible, and the consequent expense and delay in picking, which ought to be done by women and boys.

Drying.—It is lamentable to hear of the shameful waste undergone when we have what is called a glut of fruit. I have heard of tons of plums in Worcestershire rotting because of the excess. There is no doubt that all this material could be saved and turned into food. The Persian shepherd goes out to his work provided with a bag of dried peaches, which are so hard that he chastises his dogs with them. The dried Minch apricot is a staple caravan food, made into cakes and carried in a small compass. We pay a large sum to the French for dried plums, and the ladies in Portuguese convents are properly employed in preserving the delicious Guimaraens plums. The absence of sun is no excuse for our being so backward in these matters. We can and do ripen grapes as well as the hot sun of Spain, and artificial help will serve us as well for drying fruit as for ripening grapes.

The disastrous malady termed canker may be much alleviated by attention to the soil constituents, and in a paper read at Birmingham Mr. Tonks stated that he had removed the disease by the application of chemical manures, potash being the principal ingredient.

The trees in my soil are almost entirely free from the disease, and this immunity is probably owing to the abundance of potash, which should be returned to the soil at every opportunity. The dressing applied by Mr. Tonks consists of nearly equal quantities of superphosphate of lime, nitrate of potash, nitrate of soda, and sulphate of lime. Although pruning may be carried to excess,

it must not be neglected, as it is desirable to grow fruit and not wood. It can be seen by measurement that much room is wasted by profitless and barren shoots. With judicious pruning this need not occur.

The Royal Agricultural Society has, for the first time, offered prizes for preparations of fruit next year. It has been a long time recognizing the fact that land produces other necessaries than corn and cattle. We fruit-growers have done very well without this recognition, which has come a little late in the day. It is, however, a step in the right direction. The advance of pomology during the last thirty years has been quite as rapid as the advance of agriculture, and we may be certain that there is no finality. Fruit-growing, I beg leave to state, is not the handmaid, but the helpmeet of agriculture, and I believe the best interests of the land would be served if landlords and tenants would meet to discuss the conditions under which they can advance the cultivation of fruit to their mutual advantage, and if these meetings were made public every village in England would be benefited; in time competent advisers would be provided, and as the interests are national, it is hoped that means would be found of advancing money at a low rate of interest. There can, I think, be no fear of the supply overtaking the demand, and it is certain that foreign competition would not prevail against home-grown fruit if produced in sufficient quantity and of good quality.

The production of fruit under glass requires capital and skill, and although not national is, and will become, an industry of great importance. Nearly forty years since my father proved that the cultivation of peaches and nectarines could be carried on in unheated glass houses with a certainty of success unknown to wall culture. The orchard house has now become an established fact. For some time before this system had been in full work, the only early peaches—that is, those ripening in July—were the Early Nutmeg, the Early Ann, the Double de Troyes, all of them almost worthless except for precocity; now, however, we have ripening the 1st July the Alexander, an American peach, closely followed by the Early Beatrice, Early Louise, Hales' Early, Rivers' Early York, ripening during a month in which thirty years ago there was not a peach worth having. During the months of August, September, and part of October, there can be grown a continuous series of peaches. The advance in nectarines is equally conspicuous, the Lord Napier beginning a supply of nectarines of high quality in August, which other sorts continue until the end of September, and ceasing with the Victoria. With these varieties, which were certainly not avail-

able thirty years since, an orchard house will give a continuous supply of peaches and nectarines for four months; a house 100 by 24 feet, properly managed, will produce over 3000 fruits of high quality. Such a house was built in 1855 at a cost of 147*l.*, and has produced for the last twenty-five years between 3000 and 4000 fruits annually. The cultivation of grapes is advancing in our own islands with extraordinary rapidity, and although we hear complaints of the lowness of price, we do not hear that building grape-houses is declining; a good proof that no fear is entertained of the future prospects of grape-growing.

Cold Storage.—The principle of cold storage is likely to be of very great importance in the future, and experiments are now being made with regard to the preservation of fruit under the influence of cold. Now I am convinced that if a low temperature cannot be usefully applied to keeping fruit, it may be made very useful for the storage of trees, particularly of pear trees on the quince stock. What I have to suggest is that pear trees on the quince stock may be placed in pots in a cold storage in a temperature not lower than 36° Fahr., and retarded until the middle of April. By this means the blooming season may be kept back until all danger from spring frosts is past. The fibrous roots of the quince and the slow growth of the pear render this class of fruit tree particularly suitable for this method; and as large pears are worth in November and the succeeding months from 6*s.* to 8*s.* per dozen, cold storage, if possible, and if room for trees can be provided, will give a handsome profit. I tried some few years since to find a system which I could employ, but I was then offered small receptacles like a miniature chest of drawers, when I wanted room for hundreds of trees.

In Belgium it is customary to form clubs of fruit-growers to compete at the various horticultural shows; the combination of growers enables each man to choose his own particular fruit to show with his club. These contests are very interesting, and would, I think, if carried out in England, cause much friendly rivalry, and advance the interests of pomology. I must conclude by saying I cannot hold out any hopes of creating a large fortune by fruit-growing; but it is an investment and an occupation which affords a more or less certain income, which will become more certain with improved means of preservation.—*Reprinted from the 'Gardener's Chronicle.'*

18.—*Dessert Pears. The Fewest Necessary to Supply Ripe Fruit from August to March.* By W. WILDSMITH, Heckfield, Hants.*

THE subject of this paper was suggested to my mind by the controversy anent the reduction of the varieties of fruits—pears in particular—that took place in one of the horticultural journals a few months since. The general tone of that discussion went to show that there was a unanimous feeling in favour of reducing the number of varieties, but to what extent opinions differed greatly, twelve being suggested by more than one writer as the maximum number of varieties—a proposition that in some respects I had a good deal of sympathy with; but the number twelve ended, so far as I was concerned, simply because I knew from years of experience that no twelve kinds that could be named by the greatest experts in pear-lore would suffice to give an unbroken succession of ripe fruit throughout the pear season—say from the beginning of August to the middle of March. That twelve kinds might be selected that would extend over the pear season is quite another matter. I have long had the honour to serve an employer whose favourite fruit is the pear, and consequently have had to give special attention to it; and if one point more than another has had to be studied, it is that of quality: a solitary flavourless fruit of an otherwise good variety has not unseldom been the cause of the condemnation of the variety generally. I name this to show that my experience has been gained at some cost of labour and anxiety, and, at the risk of being considered egotistical, I think this entitles me to speak with some degree of confidence anent this matter of limitation of sorts. Every fruit-grower knows how precarious and how variable the pear is in different soils, aspects, and positions, and no twelve kinds, however good they may be in one garden or district, will be equally so in another, even but a mile or two away, nor even in the same garden can they be relied on to be of the same excellence any two consecutive years; and it is this precariousness that I think renders it necessary to grow a goodly number of varieties. For the purpose of this paper I have closely examined the pear notes in my diary for several years, in which is noted date of gathering, of ripening, and duration, *i.e.* time they continued fit for table; and from these notes I have compiled a list of twelve that, supposing I was compelled to grow only that number of kinds, would be likely to give me the most regular (not constant) succession of fruit. They are placed in the order in which they ripened here: Williams' Bon Chrétien, Fondante d'Automne, Beurré Superfin, Marie Louise,

* Paper read at the Chiswick Fruit Congress.

Thompson's, Doyenné du Comice, Glou Morceau, Winter Nelis, Josephine de Malines, Huyshe's Victoria, Easter Beurré, and Bergamotte Esperen.

These twelve kinds constitute the cream of all the varieties (nearly one hundred) that are grown here, and out of the twelve there are but two that are at all liable to prove of doubtful quality, and this from a cause over which we have no control, namely, a sunless season. The two kinds in question are Easter Beurré and Bergamotte Esperen, both of them late varieties, and requiring a longer season of sunshine than the others. I may, however, add that I have occasionally in a sunless season had recourse to means that have tended to make both of the kinds palatable; namely, by wrapping the fruit separately in tissue paper, and placing them in shallow baskets in a dry, warm room, for ten days or a fortnight before the fruit were required for use. And now with respect to the question of the number of varieties "necessary to ensure a continuous supply of ripe fruit." I have, after considerable deliberation, founded on the practical experience of many years, come to the conclusion that it is next to impossible to accomplish the feat with a less number than twenty-five varieties. To some this number may appear excessive, and to such I ought to explain that my experience is given from the standpoint of a private gentleman's gardener—say of a large garden—and from which liberal supplies of pears are demanded the season through, and therefore it is necessary to have, as it were, two strings to one bow; as, for instance, if Williams' Bon Chrétien Pear run short, I ought to have Beurré de l'Assomption to supply the lack; or if Marie Louise be scarce, I must eke out with Beurré Bosc, and so on, to the end of the chapter.

I regret that I have not practically tested with how few it is possible to keep up a constant supply, but I am sure I should fail if I undertook the task with a less number than twenty-five, and the following are their names, and placed in order of ripening:—Souvenir du Congrès, Williams' Bon Chrétien, Beurré d'Amanlis, Fondante d'Automne, Louise Bonne of Jersey, Madame Treyve, Beurré Hardy, Beurré Superfin, Seckle, Marie Louise, Doyenné du Comice, Thompson's, Duchesse d'Angoulême, Glou Morceau, Winter Nelis, Comte de Lamy, Beurré Bachelier, Josephine de Malines, Winter Crassane, Huyshe's Victoria, Olivier de Serres, Easter Beurré, Ne Plus Meuris, Knight's Monarch, and Bergamotte Esperen. All these are generally well-known varieties in most parts of Britain—proof sufficient, I think, of their excellence; and I can vouch for their reliability for this district in respect of constant and free [illegible] their high quality.

The least meritorious in the list are:—Madame Treyve (quickly over), Duchesse d'Angoulême (gritty), Beurré Bachelier (mealy), and Ne Plus Meuris (also gritty), yet I know no other four kinds that can—all points considered—replace them. Lest any one should conclude from what I have said as to the number of kinds to ensure a regular succession of useful fruit, that is all that is required to make certain of the supplies, I will undeceive them at once by saying—no. There is no fruit that gives better returns for labour expended, and none that more quickly resents the "let alone" policy that one is occasionally compelled to behold. As regards the former, nearly all our trees are grafted on the quince, from which stock it is no exaggeration to say that we get at least double the fruit that we do from trees on the pear stock, and high feeding is therefore a matter of necessity; but the labour of applying these manurial mulchings we place as a set-off against that of the time expended in root pruning, that nearly all trees on the pear stock require about every alternate year, and the fruit is neither so numerous nor so well coloured, and not superior in quality. No, if good crops of fruit are expected annually, water and mulch, mulch and water, must be the order of the day all through the fruit swelling season. Those that must by reason of restricted space grow only a few varieties, and whose demands for fruit are, as a matter of course, proportionately restricted, may do something towards lengthening out the supply of ripe fruit by gathering the same variety of pear at varying intervals of from a week to ten days. The fruit of most varieties—more especially the earlier kinds—will then ripen at similar intervals, and thus the season of ripe fruit be considerably extended. To those that have unlimited room, and can therefore grow the required number of varieties to ensure supplies, this piecemeal gathering is not of so much consequence; nevertheless I strongly advise its being done with any varieties that ripen rapidly, such as Citron des Carmes, Jargonelle, Williams' Bon Chrétien, and Fondante d'Automne.

19.—*The Cure of Canker in Fruit Trees.* By E. TONKS, B.C.L., Knowle, Warwickshire.

IN 1886 my attention was specially directed to plant food, having been requested to write a paper on that subject for the Birmingham Gardeners' Association. In the same year, having noticed that a number of apple trees in my collection had become unsightly through canker, I marked about a dozen of them for destruction; but while studying the subject of plant food, which involved the consideration of the analysis of

various plants, I was very much struck with those of the fruit and wood of the apple in Wolff's *Aschen Analysen*, the great authority on plant analysis. I found that the fruit contained an exceptionally large proportion of soda and the wood of lime. This at once suggested the idea that my soil might not contain sufficient of one or both of these elements to supply the wants of the apple tree; therefore I resolved, instead of destroying the marked trees, to give them and all my apple trees a good dressing of a complete artificial manure which contained full proportions of soda and lime. In the following season, 1887, which was exceptionally hot and dry, either through the drought, the manure, or some other cause, not a spot of active canker could be found; all the edges of the old wounds on the marked and other trees, almost as badly affected, had put out granulations and healed over, and the trees, many of which had previously ceased to extend, made healthy and vigorous growth. Last winter the trees were again dressed with the same manure; this season they have been exposed to the most unfavourable conditions; the soil to a great depth was almost dust dry when they were making their first growth, while an army of caterpillars ruined what foliage was made. Then followed the most continuous cold weather and rain experienced for many years. Notwithstanding conditions so conducive to the extension of disease, there is at the present time still no appearance of active canker. The trees have been carefully inspected by some experienced pomologists who, doubtless, will confirm my statement. Short as is the time during which the trees have been submitted to the treatment, I can only conclude that the arrest of the disease is due to the supply of elements of food required by the trees, of which a sufficient quantity was not previously contained in the soil.

The food required by a plant is a complicated mixture of many elements, all of which are necessary for its well-being; the complete absence of one of them would be fatal; a deficient supply of one would arrest its development, and render it subject to disease. Nothing is more instructive and conclusive on this point than the copies of photographs of plants grown for the purpose of testing the effect of manures more or less complete to be found in treatises on the subject. That of Ville on *Artificial Manures*, published by Longmans, contains many such illustrations, which clearly show that when the soil contains every element of fertility but one it remains absolutely barren. For instance, in a soil without potash, the vine makes no growth.

It remains to say that the manures necessary to restore a tree to health vary as the soils: although the ashes of the wood

of the apple tree contain 71 per cent. of lime—an exceptionally large quantity—it would not be necessary to supply this element on a lime formation; nor would soda be required in a soil near the sea, although on other geological formations or situations a deficiency of one or both may be the cause of canker. Like conditions apply to the other elements.

Various soils require such manures as will supply their various deficiencies; but as it is most difficult to ascertain even by analysis what may be the deficiencies of a soil, the practical way of dealing with the subject is to study the analysis of the ashes of the plant in question, and to use a manure which is composed of these elements; for instance.

The ashes of the wood of the apple tree contain:—Potash, 12·0; soda, 1·6; magnesia, 5·7; lime, 71·0; iron, 0; phosphorus, 4·6; sulphur, 2·9; silica, 1·8; chlorine, 0·2. And those of the fruit:—Potash, 35·7; soda, 26·1; magnesia, 8·8; lime, 4·1; iron, 1·40; phosphorus, 13·6; sulphur, 6·1; silica, 4·3; chlorine, 0. Ville lays down the rule that soils generally contain sufficient of all the mineral elements except potash, lime, and phosphorus, and the gaseous element nitrogen, and says it is only necessary to supply to the soil manures which contain these four. This may be sufficient for the general purposes of cultivation, but more recent experiments have conclusively proved that the addition of a small quantity of iron largely increases the development of foliage, and consequently of the plant. In dealing with a mysterious disease such as canker, I should not leave out either iron or magnesia.

The following formula, which may be varied as circumstances require, is suitable for the apple tree:—

Superphosphate of lime	12 parts.	Sulphate of magnesia	2 parts.
Nitrate of potash ..	10 „	Sulphate of iron ..	1 „
Chloride of soda	4 „	Sulphate of lime ..	8 „

This may be used at the rate of ¼ lb. to the square yard over the whole extent of soil within reach of the roots. It need not be dug in; one effect of the manure may be relied on: if it does not cure canker, it will, at any rate, most certainly benefit the trees.

I hope you will excuse me for having questioned some of the conclusions of great horticultural authorities, but it seems that some of these conclusions have been accepted, without sufficient examination, as being time-honoured traditions handed down through many generations. Gardeners are, in this respect, perhaps a little too conservative.

I think much may be learnt by occasionally departing from these traditions and making independent experiments in culti-

vation; my own experience proves that many such experiments resulted in failures, but there is full compensation if only one useful discovery be made, or one error exploded.—*Extracted from a paper read before the Chiswick Fruit Exhibition and Conference, October*, 1888.

20.—*Packing Fruit.* By J. WEBBER, Covent Garden.

IGNORANCE displayed in packing, and want of knowledge of the condition in which fruit should be sent to market, are the principal causes of loss to the fruit-grower in this country. In packing we are far behind our continental brethren, for while they study not only the condition most suitable for travelling, but even the package in which the fruit is to be sent, we frequently send it too ripe, and make use of any package that may come to hand, with little regard as to whether it is too deep or too shallow, or will hold such quantities as are ordinarily marketable.

Packing is such an important factor in the attainment of good prices for market produce, that it ought to be one of the essential points in the education of a gardener; for what is the use of growing the best fruit in the world if it be spoiled in transit? At least one-third of the hot-house fruit sent to market is depreciated in value, and sometimes rendered worthless, by the bad packing; whereas, if all came in marketable condition the price would be lower to the consumer, the supply being larger, and a better result all round would accrue to the grower. Bearing this in mind, I beg to submit the following remarks as applying to London markets.

There are three golden rules to be observed in sending fruit to market.

1st. Never send it too ripe. Peaches especially should be packed hard, as they travel better in that condition, and are rarely used by the shopkeeper till two or three days after purchase.

2nd. Never, if possible, send it for Saturday's market, as, with the exception of strawberries, the retailer invariably provides himself beforehand with what he requires: Monday and Tuesday for the first part of the week, Wednesday and Thursday for the latter part. In hot weather, when fruit ripens fast, small consignments may be sent on Friday.

3rd. All fruit should be sorted into bests and seconds, and in some cases into thirds, as there are always buyers of bests, and buyers of seconds and thirds, but seldom buyers of mixed qualities.

Grapes.—Among hot-house fruits, grapes, as growing all the year round, claim our first attention. There are two sorts of baskets in which grapes may be sent to market—viz., the "handle" and the "baby." The former is more useful for ordinary work and is safer, as the handle is used for lifting, and to a certain extent is a protection to the fruit in preventing other goods being placed on the top. A little packing should be placed in the bottom of the basket, then a lining of white paper. The bunches should be packed close together, shoulder upwards, and the basket tied over with a sheet of stiff paper with a label "Grapes with care" on it. Grapes packed in this way will travel any distance. Special bunches travel in "handles," each bunch tied to the basket, without the centre being filled up. The latter mode is recommended in the case of special fruit only. The "baby" basket should only be used for short distances, and where a regular supply is sent, and where the railway porters are accustomed to them. It is more convenient than the "handle" for displaying in the shop windows, and shows off the fruit better. The basket should be lined with white paper and a little packing in the bottom, the bunches being simply laid in close together. The whole fits nicely into a hamper known as a "flat," and, with the ordinary grape label, invariably arrives in good condition.

Peaches should be packed in shallow boxes of sufficient depth to allow a good bed to lay upon and a slight layer of packing on the top. The box should contain only twenty-four best or thirty-six seconds. Each fruit should be wrapped in soft paper. A very effective way of packing peaches, so as when the box is opened the class of fruit can be seen at once by the buyer, is to roll a double slip of tissue paper round each fruit, leaving the crown exposed. This requires a sheet of paper to be placed over the fruit before finally filling up with the packing. I know of no packing better than moss, which should be properly dried and cleansed from all grit. It is cooler and more elastic than any other substance. Each fruit should be completely surrounded with it. Next to moss is bran, but care should be taken to shake it down well and refill the box before fastening the lid, as it settles down with the oscillation of travelling, leaving part of the fruit exposed and liable to injury. Wadding is not elastic, and is too heating.

Strawberries should be packed in boxes in single layers containing from 1 lb. to 1½ lb., according to size, each strawberry being placed in a strawberry leaf on a thin layer of moss, with only a light layer of leaves on the top. Each package of, say, five or six boxes should have a label, "Strawberries, with care, this side up," on the top of it. When the season is full on,

they lose value if delivered after 8 A.M., as the trade then supply themselves from the "morning gathered," delivered by the growers themselves.

Tomatoes should be packed in "handle" baskets containing from 18 to 20 lbs., and should be well coloured, but not too ripe, otherwise they are apt to split.

Out-door Fruit.—Suitable baskets for sending out-door fruit to market can always be obtained of the salesmen. These consist of quarter-sieves, half-sieves, and sieves. The former hold 12 lbs., and are used for best samples of all kinds of soft fruit. Half-sieves are used for cherries, currants, plums, pears, and apples. Sieves are used mainly for apples. A half-sieve of soft fruit should contain 24 lbs., of plums 28 lbs., of apples 21 to 24 lbs. Soft fruit should be simply stuck down with a sheet of paper. Hard fruit should be stuck down with dry packing, such as hay or straw. All fruit opens better with a sheet of paper covered over.

Pears, especially early varieties, should be sent directly they can be removed from the trees. On no account should they be allowed to get ripe. The system in vogue in France is well worthy of imitation by growers in this country. The fruit is carefully sorted, in many instances into four sizes. Cases are made to contain two tiers, each tier consisting of twenty, twenty-four, thirty, and thirty-six fruits. A layer of paper shavings is placed between each tier, and one top and bottom. When the fruit is extra large and kept late in the season, cases to contain a single layer of twelve and fifteen are used. If packed in half-sieves, the better sorts should be placed in layers with a little packing between.

Carriage.—With regard to the cost of carriage, little can be said here except that the rates, as we all know, are very unsatisfactory, little or no inducement being held out by the great carriers for the development of produce on a small scale. Special rates may sometimes be secured for regular consignments over 28 lbs., but even then there is often a difficulty in keeping the railway company to their contract. All goods by passenger trains should reach the market by 7 P.M., so as to be ready for the next morning's trade, as if not they are seldom delivered till after the market is over, and therefore lose in value.

21.—*British Tobacco.*

[illegible] Chamber of Commerce has printed the report of [illegible] judges in the tobacco prize competition, the substance of [illegible]ich is as follows:—

"In deciding upon the merits of the various specimens of

British-grown tobacco forwarded for competition, we have, as far as possible, adhered to the conditions originally laid down by the Tobacco Trade Section of the Chamber when the prize was offered.

"Briefly, these conditions required that each specimen submitted for the competition should consist of a not less quantity of tobacco, grown on a commercial scale, than 400 lbs. in weight. It was also stipulated that each sample should embrace an average of the crop grown, and that such particulars should be given by the growers as would assist the judges in making 'a report on the yet doubtful question as to the possibility of growing tobacco in Great Britain such as in quality relatively to price can compete with that of other countries.' In the first instance it was required that tobacco grown in the United Kingdom should be sent for inspection on or before the 1st of March, 1888, but in order to meet the wishes of many of the growers, the time was subsequently extended to the 1st of May. This change, and the arrangements made for receiving the tobacco for greater convenience at the Fenchurch-street warehouse of the East and West India Dock Company, were the only modifications of the original conditions.

"The various entries of tobacco, numbering eleven in all, were duly inspected by the whole of the judges on the 14th of May, 1888, at the Fenchurch-street warehouse. It was found that only four exhibitors had complied with the conditions of the competition, so far as quantity was concerned; but in view of the interest which is being manifested in regard to tobacco-growing in the United Kingdom, we consider it desirable to present a supplementary report on the remainder of the specimens, though not properly coming within the scope of our adjudication.

"We place the four exhibits submitted to us in the following order of merit:—1st, Messrs. James Carter and Co.; 2nd, Mr. W. L. Wigan; 3rd, Sir Edward Birkbeck, Bart., M.P.; 4th, Mr. John Graves. We therefore recommend to the Section that the prize of fifty guineas should be awarded to Messrs. James Carter and Co."

Particulars respecting the various exhibits and remarks of the judges then follow, and the Report is concluded with these general observations:—

"Speaking generally, not one of the four samples eligible for the prize was in any respect valuable for trade purposes, or even merchantable, presuming that no duty was chargeable upon the article. Still it was evident that well-grown tobacco leaf can be produced upon English soil, though, of course, this admission in no way takes account of the cost of production.

"Several growers had employed three or four different kinds of seed, but in every case the type of leaf produced was always more or less alike in each separate locality, whatever seed was sown, thus indicating how powerful and controlling an influence is exerted by the soil on which the tobacco is raised.

"None of the samples submitted to us were sufficiently good to compete with foreign growths of similar grades in their then state, and most of them gave no promise of attaining it under any conditions. The exceptions to this general statement were the parcels sent by Sir Spencer Maryon Wilson and Mr. John Cairns, which, in the absence of the excessive moisture contained in them, might realise in the trade something like the prices of inferior kinds of American tobacco.

"The whole of the exhibits were apparently grown last year, and for the most part were fresh, moist, and partly unripe when submitted to us. It was evident that the leaf had been cut in most cases before it had fully ripened, so that, even with sufficient fermentation, it would not be likely to materially improve either in flavour or 'burning' qualities. Even where the crop had matured before being gathered the tobacco was not marketable, owing to the process of fermentation or 'curing' and 'sweating,' being either incomplete or wholly unattempted. This process is necessary as regards many varieties, in order to obtain the proper colour and flavour, as well as to make the tobacco burn well, and it also deprives the leaf of many narcotic objections. In other words, it is an important factor in making tobacco a marketable article. The quantity grown by various exhibitors was not sufficient in most cases to allow of the process being properly carried out, but English growers will do well in future to pay more attention to a matter which foreign planters regard as being of first importance.

"With regard to the prospects of tobacco-growing on a remunerative basis in England, we share the opinion that, even under the most favourable conditions possible, such a crop cannot be made to pay, and that in most seasons it must be an absolute failure and heavy loss.

"The climate of this country, to begin with, is less favourable than that of Kentucky or Virginia, and the cost of production will be found far greater here than in the United States.

"Until the curing of tobacco is perfectly well understood in the United Kingdom, the finest leaf that can be grown will be absolutely wasted and useless. In fact, in curing tobacco the 'expert' is as essential to the planter or grower as the scientific brewer is to all great breweries. Even supposing tobacco could be grown here as cheaply as in America—a point regarding which we have great doubt—the prejudice of the manu-

facturer and the long usage of the trade will have to be overcome before the English product can enter very largely into successful competition or consumption on a commercial scale.

(Signed) W. H. WILLS,
Chairman of Committee of Judges.
W. FREAM, C. AUG. MULLER, } *Honorary Secretaries.*"

22.—*Remarks at the Devonshire Pomological Society.* By SIR T. D. ACLAND, Bart.*

IN declaring the Show open, Sir T. D. Acland said that although he could not claim to be an active promoter of this Show, he was much honoured by the invitation to be its President. In former times he had endeavoured, with the help of his friend Mr. Belfield, to promote a knowledge of fruit growing through the 'Journal' of the Bath and West of England Society, a Society which, at its meeting in Exeter in 1889, would gladly help on the good work. He (Sir T. D. Acland) had rather a preference for the early English title—Apple and Pear Show. The word Pomology appears to be a hybrid.

In Greek, he could only find *poma*, which means drink; and he feared his temperance friends would not like that for one object, though the making of pure and good cider was not to be despised. He read a passage from Lord Carnarvon's pleasing translation of the 'Odyssey,' book vii.:—

" Hard by the gates, without the courtyard, lies
A goodly orchard, some four acres wide,
Fenced in on either hand: within its pale
The tall trees stand and blossom: thus the Pear,
The bright hued Apple, and Pomegranate grow.
The blooming Olive and the luscious Fig,
Whose fruit, the livelong year, nor falls nor fades
In winter's cold or summer heat; but age.;
The soft west wind ripens or brings to birth
Each in due season. Pear to Pear succeeds,
And Fig and Apple, and the clustering Grape
Their harvest yield."

This showed that the poet who wrote or rather sang 1000 years before the Christian era was not ignorant of apples and pears.

From Greek he turned to Latin, and then referred to an article on Pomona in the 'Edinburgh Review,' 1833, to which his attention had been directed by Mr. Josiah Goodwin, once honourably connected with the Exeter press. Pomona was a coy

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* Fourth Annual Exhibition of apples and pears, held in Exeter, October 25 and 26, 1888.

goddess difficult to win. She was courted by Vertumnus, a versatile deity. An old classical authority said that he won his suit by appearing in the guise of an old woman. This might represent the old traditions of Exeter city, *semper fidelis;* but it did not represent the energy of the Mayor, who, when Art, or Commerce, or Literature wanted his help was ever ready. A more recent classical authority said that Vèrtumnus won his suit as a handsome young man. Anyhow, they were much indebted to the Mayor for the present most useful and beautiful exhibition. Sir Stafford and Lady Northcote were present, whose hereditary interest in the trade of England and the welfare of her colonies were well known. To come to a more practical view of the exhibition, there could be no doubt that there was much need for encouraging the growth of fruit on small holdings as well as on farms. He had noticed in the 'Gardeners' Chronicle' some speeches laying blame on the landlords for not encouraging fruit-growing. To this even this exhibition might afford an answer. But he (Sir T.) was used to being told that all the evils of Society were caused by the wicked landlords. He thought the statements he referred to were somewhat exaggerated. However, there might be need for some alteration in the law as to compensation for the planting of fruit trees. His own gardener, Mr. Garland, had been doing a good deal to introduce better sorts of fruit for sale; he believed that his tenants and neighbours were becoming every year alive to the profit to be derived from this source. If he might venture to urge what he had been told by practical judges, it were better not to think too much about multiplying new sorts, but to find out the few which are most marketable, and to bring them forward, in the best condition, at the season when they were most in request.

23.—*Summarized Results of the Agricultural Returns for* 1888. Abridged from the Returns issued by the Agricultural Department.

HEREWITH is given the information, usually comprised in the Agricultural Returns of Great Britain, for the year 1888, with the Summary Returns for Ireland for the same year.

ACREAGE UNDER CULTIVATION.

Of the Returns which have this year been obtained the following appear to have been the general results in Great Britain:—The total extent of land returned as under cultivation of all kinds of crop, bare fallow, and grass, exclusive of

heath and mountain pasture land, and of woods and plantations, amounts to 32,684,399 acres. . . . .

Comparing, then, the 32,615,304 acres for 1887 with the total acreage of cultivated land returned this year, namely, 32,684,399 acres, there is an apparent increase of 69,095 acres.* Apart from this there has been an increase due to land newly brought into cultivation, amounting to 32,371 acres, being 9655 acres in England, 9715 acres in Wales, and 13,001 acres in Scotland.

Acreage under Corn Crops.

Looking at the details in the acreage of the different crops in Great Britain it is found, as regards corn crops, that, compared with 1887, there is a very important increase in the area under wheat, and a large decrease in that under oats, whilst the total acreage of barley is practically identical with that of the preceding year.

The total area returned under wheat in Great Britain is this year 2,564,000 acres, an increase of 246,900 acres, or 10·6 per cent. more than that of the area of 1887, and nearly 90,000 acres more than the average of the previous five years.

This large growth of wheat is stated by many of the collectors to be due in great measure to the nearly complete failure in their districts of the root crops last year, which thus allowed a considerable quantity of land, whereon roots had failed, to be ready for sowing, and the favourable seed time for the purpose is also almost universally noticed. Allusion was made, in the Report for 1887, to the relatively high value of wheat straw having influenced the acreage then returned under wheat, and, according to the officers, it seems that this has been again a potent factor in contributing to the result shown for the present year; the shortness of straw in respect to all the corn crops having, in 1887, been general throughout the Kingdom. By some collectors it is mentioned that farmers on the whole found wheat in 1887 their most paying crop, and have therefore devoted all available land to it, the price obtainable by them for the straw, wherever restrictions upon its sale have been relaxed by landlords, offering a great incentive to wheat production.

There is however, unfortunately, hardly any room for doubt that the unseasonable character of the weather during the present summer materially retarded the development of wheat, and interfered with its maturity, and that these circumstances will have had a disastrous effect on the crop harvested, in yield of grain at any rate, while its quality will probably be inferior. This must be again somewhat discouraging to farmers, whatever may be the results in bulk of straw. Apart from this consideration, it would appear from the statements occasionally made, that while the demand

* The 18,476 acres returned as small fruit last year were excluded from the general total of 32,615,304 acres, on account of the uncertainty which existed in regard to the details of the Return, whilst this year the more complete and accurate return of small fruit, amounting to 36,724 acres, has been for the first time included in the general total, and to that extent the difference between the returns of the two years is due to cultivated land previously omitted from the Returns.

for wheat straw continues to act influentially, there may be some reason to believe that the decline of wheat growing has been arrested.

In the three Divisions of the Kingdom, the acreage of wheat, compared with that of the preceding year, has increased in England by 10·06 per cent.; in Wales by 10·69 per cent., and in Scotland by no less than 36·55 per cent. It need scarcely be pointed out, however, that in the latter division the acreage grown is, proportionately to that of the other principal corn crops, much less.

As regards barley, the extent in Great Britain in 1888 was 2,085,561 acres, only 405 acres over the acreage sown in 1887, when the fact of its being then the smallest area that had ever been recorded for this crop was referred to. The causes at that time assigned for its decline, namely, the low prices for grain of this description lately obtainable, owing, partly to the substitutes for malt employed in brewing, together with the large importations of foreign barley, and, further, the discouragement due to the unsatisfactory yield of last year, when bright malting barley was scarce in most English counties, are mentioned by some collectors as reasons for its present position among corn crops. Complaints, however, are not general even in England and Wales, whilst it will be seen that for Scotland an increase of 18,700 acres, or 9·1 per cent., is shown.

Oats were sown on 2,882,200 acres, a decrease of 205,700 acres, or 6·7 per cent., from last year, when, however, it will be recollected, they covered the largest breadth so cultivated since these statistics have been obtained. The diminution is proportionately greatest in England, where it amounts to 8·58 per cent., the decrease in Scotland being 4·60 per cent., while in Wales it is only 1·9 per cent.

It is almost universally ascribed in the reports to the recent unremunerative value of this grain, in combination with the poor yield derived from last year's crop; though it was perhaps to be looked for that so large an acreage as that of oats in 1887 would be likely to be followed by a decrease in the quantity grown this year. The importations of foreign oats have, moreover, since the preceding harvest, increased in a still larger ratio even than those of barley, while the decrease in the numbers of cattle and horses recorded this year has doubtless also been a sufficiently important element in contributing to the deficiency.

Of the other corn and pulse crops, the acreage under rye shows an increase of nearly 20,000 acres. Beans have decreased by 31,600 acres, the results of the dry summer of 1887 being mentioned as a principal cause for the decline, while peas have increased by 11,900 acres.

Taking, then, all the figures as to corn crops in Great Britain, we find their total area was 8,187,700 acres, an increase of

41,800 acres over that of 1887, but nearly a million acres less than in 1878, when corn crops covered 9,167,600 acres.

Green Crops.

As regards green crops in Great Britain in 1888, about 590,000 acres were planted with potatoes, an increase of 30,500 acres, or 5·4 per cent., over the quantity of land so returned in 1887. From recent notices which have appeared in respect of the probable production, it seems that in some districts the crop will this year, however, be seriously affected by disease, from which that of 1887 was almost free.

Turnips and swedes were returned as grown on 1,944,000 acres against 1,972,000 acres in 1887, a decrease of 28,000 acres.

The drought of that year proved so unfavourable to this crop in some counties that it is noticed as having affected the area sown this year, but the decrease is likewise attributed to the diminished numbers of sheep and cattle, to be presently referred to, for which, under other circumstances, provision would have to be made.

For mangold the acreage corresponds closely with that of last year, being now 361,000 acres, and cabbage, kohl-rabi, and rape have increased by 5700 acres, while carrots, vetches, lucerne, and other green crops unenumerated, have together decreased by 500 acres only. A considerable addition, of 35,400 acres, is shown, however, for vetches, if separately compared, the advantages of the crop as an early one for live stock being constantly referred to.

Altogether the total area of green crops was 3,471,800 acres, an increase of 8100 acres over the figures of the preceding year.

Flax.

Among minor crops, flax was grown on 2,200 acres, a decrease of 1500 acres.

Hops.

Hops have further declined. They were this year returned as cultivated on nearly 58,500 acres, as compared with 63,700 acres in 1887, a decrease of 5200 acres, or 8·2 per cent., while it is to be feared that the crop will have been picked from a much smaller acreage. The chief deficiencies are in the counties of Kent and Sussex, where they amount respectively to 3589 and 1326 acres. In the former of these a decrease of nearly 4000 acres was recorded last year, when comparing the acreage under hops with that of 1886.

The reluctance to continue the growth of a crop which is so uncertain and at present so unremunerative as hops is referred to in most of the reports from hop districts in connection with the diminished acreage shown, and little doubt is said to be entertained but that the decline will continue.

Bare Fallow.

Bare fallow has further decreased in Great Britain from 485,874 acres to 456,858 acres in the present year. The area in 1887 having been, as was then mentioned, smaller than that of any former year. The fine dry seasons in autumn and spring are noticed as having enabled farmers to clear the land for cultivation or bring it under grass. A diminished extent is observable in almost every English county and in Wales, there being a slight increase in Scotland.

Rotation Grasses.

Clover and rotation grasses show a decrease in Great Britain, their extent being 4,724,299 acres, or 56,728 acres less than in 1887, distributed in a diminution of 32,459 acres for hay, and of 24,269 acres in those not intended to be so used.

Permanent Pasture.

For permanent pasture in Great Britain there is again a further extension, although not nearly in the same degree as that recorded under this head in each of the two last preceding years. The results are now shown in an area of 15,746,200 acres, as compared with 15,671,400 in 1887, an increase of 74,800 acres.

Of the total quantity of land included in the Returns as under permanent pasture this year, that for hay, amounting to 4,776,900 acres, exhibits an increase of 214,600 acres, while for grass not reserved for this purpose, there is a decrease of 139,800 acres, due, in the latter instance, it is said, as well as in the smaller area under clover and rotation grasses, to the lessened requirements for live stock, in which there is an important decline in numbers both of cattle and sheep, and for which provision in respect to grazing would otherwise have to be kept in view.

As regards the large increase under the head of grass appropriated to hay, which the Returns of 1888 show when compared with those of the previous year, it is again noticed frequently in the reports as being the result of efforts on the part of farmers to provide adequately for requirements in respect of hay during the forthcoming winter and spring. It will be remembered that the produce of hay, both from permanent pasture and likewise from clover and other grasses in 1887, was, consequent upon the drought of that year, a poor one. The enhanced value of hay was therefore maintained, while farmers, owing to the failure of the root crops and the exhaustion of their smaller stocks of dry fodder, were obliged to purchase largely. Although this led to considerable realisation upon live stock, in many parts of the Kingdom, yet the subsequent severe and prolonged winter caused a larger consumption of hay than usual for such store stock as farmers felt compelled to keep. These reasons have, as last year, again,

it appears, been the inducements to reserve for mowing as much of the Permanent grass as was thought practicable. The cause before mentioned, in regard to straw, is also, in one of the reports, relating more particularly to some of the South and West of England and Midland Counties, referred to as having there contributed to the result, viz., that, in the present condition of agriculture, tenants are no longer restricted to rotation farming, and that as the removal of hay and straw from the farm is not now generally prohibited, the ready market at the high prices which both command has influenced the acreage devoted to their production.

Arable Land.

The area of land under arable in Great Britain in 1888 is this year apparently less by 5700 acres, about 16,938,200 acres being returned against 16,943,900 acres in 1887. This diminution, however, is in striking contrast with the falling off recorded in arable land in each of the years 1887 and 1886, when the year 1887, compared with 1886, showed a decrease of 112,000 acres, while comparing 1886 with the preceding year the deficiency amounted to no less than 146,000 acres.

The relative proportions of the whole quantity of land cultivated in Great Britain are now:—48 per cent. under permanent pasture, 25 per cent. under corn crops, and 11 per cent. under green crops.

Small Fruit.

The extent of land returned as under the culture of small fruit, such as gooseberries, currants, strawberries, &c., whether in orchards or in market gardens, amounts this year, as has already been stated, to 36,700 acres.

In many counties the collecting officers report that the practice among farmers of appropriating land to the growth both of fruit and vegetables has further extended in order to meet the demand for them, and though the additional quantities of land may, as regards individual occupiers, be relatively small, in the aggregate they become considerable. It is stated in a report from the County of Norfolk that from only one small station on the Eastern and Midland Railway nearly a hundred tons of fruit are sent weekly to Manchester and other towns in the North of England, at certain periods of the year; and this is cited as a single illustration only of what is being done throughout that county.

Orchards, Market Gardens, &c.

There is this year a decrease of 3056 acres in the area of orchards in Great Britain, it being now 199,178 acres, but the smaller extent here shown must be considered in connection with the newly ascertained acreage of small fruit, the apparent deficiency having doubtless arisen from part of the land which should last year have been returned as growing small fruit having then, in some cases, been placed in the orchards column of the Schedule.

The acreage now returned may, it is confidently believed, be taken to represent more accurately than in any preceding year the actual area so covered; the land under grass or upon which small fruit is grown or which is left fallow in orchards, as may happen to be the case, being included under these several heads in the Returns.

The acreage under market gardens is this year 67,383 acres, as compared with 62,666 in 1887, an increase of 4717 acres.

In land used by nurserymen for the growth of trees, shrubs, &c., the Returns show a slight decrease from the acreage of last year.

Special Return of Land under Plantations.

A special Return of the acreage of woods and plantations has been obtained this year, the last Return of this nature having been made in 1880. The acreage appears to have increased in Great Britain from 2,458,300 acres to 2,560,700 acres, or nearly 4·2 per cent. . . .

Live Stock in Great Britain.

Turning now to the various kinds of live stock in Great Britain, the record of the year 1888, as was unfortunately the case in the two preceding years, presents unsatisfactory results. There is first a decline in agricultural horses to the number of 9295, while the reduction in the numbers of this class is not made up, as was the case in 1887 compared with the previous year, by the increase in unbroken horses and brood mares, an addition of only 1262 belonging to the last-mentioned class being shown in the present year.

The decrease is frequently attributed to the straitened circumstances in which farmers find themselves, and which have compelled those with insufficient means to dispose of superfluous horses as soon as the work of tillage was completed, the scarcity and dearness of fodder being mentioned in connection with this condition of matters. This economical tendency in hard times is probably therefore the real reason for the decline in number. In one or two localities purchases of horses suitable for military purposes by the agents of Foreign Governments are alluded to.

Horses.

The imports of foreign horses into the United Kingdom in 1887 show an increase of 615 over those of 1886; the total value of those imported in 1887 being 197,679*l.*, against 189,901*l.* in 1886. The exports of English horses increased by 2137 in 1887, as compared with those of the preceding year.

Horned Cattle.

As regards horned cattle, the numbers exhibit a very im- [illegible] decrease in each of the several classes, the total number

being 6,129,375, or 311,893 (equal to 4·8 per cent.) less than in 1887, and 517,308, or 7·8 per cent., less than in 1886.

Cows and heifers in milk or in calf have decreased by 85,836, or 3·38 per cent. Other cattle of two years of age and upwards number 1,434,305, or 8·0 per cent. less, and young cattle have decreased by 101,289, or 4·32 per cent. Except in the case of this latter class, for which an increase in Scotland of 8700 is returned, the decline in numbers is distributed over the three divisions of the kingdom.

The general failure of the root crops and great scarcity of hay and other keep throughout the kingdom, owing to the drought of the summer of 1887, together with the effects of the subsequent severe winter and inclement spring of this year, are almost universally referred to by the collectors as having determined the results. The extra cost of purchased food after exhaustion of their supply of winter keep was with many farmers so serious a consideration that the obligation to realise was imperative with them, and markets were thus greatly overstocked. Young cattle likewise, which in ordinary seasons would have been kept on the farms, were sacrificed in large numbers to the butcher, with the unfailing result of forced sales, in reducing values, and further, discouraging renewal of live stock.

The falling off in the total number of cattle of all descriptions is indeed a serious one. The very unremunerative prices obtainable for young stock is frequently remarked upon, and in one report it is stated that calves have this year in some districts fetched only 25*s.* to 30*s.* a head, whereas a short time ago there would have been a demand for them at 45*s.* to 50*s.*, and that many farmers preferred to kill rather than feed them. The number of only partially stocked farms on the hands of owners are, as was the case last year, again mentioned in connection with the lessened number of both cattle and sheep. The dominant facts here given, are, in nearly all respects, a re-statement of the reasons which were put forward in explanation of the reduction in cattle of the previous year, when its results were compared with those of 1886. In some reports it is added, however, that improvement has already taken place, in an upward movement of prices, and there now appears to be promise of abundant food for each description of stock.

Sheep and lambs, taken together, show this year in Great Britain a decrease of 701,619 as compared with 1887, distributed in a reduction of 419,302 sheep, and of 282,317 lambs, the total number being now 25,257,149, and the decrease being respectively 2·6 and 2·9 per cent.

The collecting officers report that the lambing season was unfavourable in the majority of districts, some mountainous or hilly counties suffering great loss from this cause. In consequence of the scarcity of keep, before referred to, from the failure of the root crops, it is said also that the weak condition in which ewes were left, in many districts, told greatly on the number of lambs which might otherwise have come into the returns.

The rate of mortality among sheep of one year old and above appears in England to have been, from the severe winter and short keep, unusually high. The deficiencies in numbers as compared with 1887, in some counties, have been very marked, England alone exhibiting a decrease of 475,800 sheep and 187,800 lambs. The English counties which show diminished numbers in sheep and lambs taken together of over 20,000 head in each county, are Buckingham, Cornwall, Devon, Hants, Kent, Lincoln, Norfolk, Northampton,

Somerset, Suffolk, Sussex, and the three Ridings of Yorkshire. In Wales a decrease of 38,600 lambs is shown; the number of sheep have there increased, however by 36,000, while in Scotland the diminution is in lambs 55,800, which is only in part made up by the addition of about 20,500 sheep.

Pigs numbered 2,404,300 as compared with 2,299,300 in 1887, an increase of 4·6 per cent., which is again frequently ascribed to the cheapness of potatoes and barley meal, and to the relatively higher prices now obtainable for this description of stock.

IRELAND.

In the Returns of the crops and live stock in Ireland the figures exhibit changes which are, as regards crops, much in the same direction as those shown for Great Britain. There is, however, a decrease in the cultivated area (comprising all the land which is included under this head in dealing with the totals of the Returns in Great Britain) of 66,855 acres, the area being now 15,062,252 acres, compared with 15,129,107 in the preceding year.

The corn crops show altogether an increased acreage of 8714 acres, the acreage under wheat being more by 33,204 acres, and barley by 8780 acres, while oats, the most important corn crop in Ireland, were less by 35,199 acres. Rye increased by 3222 acres, but beans and peas taken together decreased by 1293 acres.

Among green crops the area under potatoes, which covered 796,763 acres in 1887, was increased by 7745 acres in 1888.

Turnips show a decrease of 5715 acres from the breadth sown last year, when about 300,000 acres were under the crop.

Mangold and beetroot increased by 4059 acres. The land under cabbage, lucerne, and other green crops was less by 2163 acres, while vetches, carrots and rape have severally increased, the total of green crops amounting to 1,234,069 acres, compared with 1,228,746 acres in the previous year, and showing an addition altogether of 5323 acres.

Flax was grown on 113,586 acres, a decrease of 16,616 acres from the acreage of 1887.

The land returned under bare fallow was more by 2973.

The area occupied by clover, sainfoin, and rotation grasses this year amounts to 1,204,500 acres, of which nearly 627,900 acres were intended to be cut for hay. The extent so covered in the previous year was 1,195,700 acres, that reserved for hay having been about 636,200 acres. The acreage of land under permanent pasture this year was for hay 1,594,700 acres, while that of land not intended for hay production was 9,328,700 acres. The figures for 1867 were respectively 1,507,300 acres and 9,492,200 acres, or altogether 10,999,500 acres.

In the returns of live stock in Ireland horses numbered 507,201, or 7871 more than in 1887. Milch cows show a decrease of 7255. Young cattle have further decreased by 7889, and other cattle of two years of age and above have diminished in number by 43,024, thus making the total number of cattle 4,099,241, or 58,168 less than in 1887.

Sheep and lambs taken together exhibit an increase of 248,363, distributed as an addition of 128,546 to sheep of one year old and above and of 119,817 to sheep under one year, the total number being now 3,626,780.

Pigs have fallen in number, and are fewer by 10,685 than in the preceding year, the total number being now 1,397,800.

United Kingdom.

Summing up, then, the figures for the whole of the United Kingdom, including the Isle of Man and Channel Islands, the variation as regards the total cultivated area is, subject to the explanation before given in respect to the total area under cultivation in Great Britain, represented by an increase of 2,445 acres.

Corn and green crops have each increased.

Rotation grasses and permanent pasture both show a decrease, owing, in the case of the first mentioned, to a diminution of 56,728 acres in Great Britain, while in the last mentioned it is due to a decrease of 76,106 acres in Ireland.

Cattle and sheep have each decreased, while pigs are greater in number.

The following table shows a comparison of the figures for the United Kingdom, including the Isle of Man and the Channel Islands, between the years 1888 and 1887:—

Acreage.	1888.	1887.	1888 compared with 1887. Increase.	1888 compared with 1887. Decrease.
	Acres.	Acres.	Acres.	Acres.
Total Cultivated Area	47,876,814	47,874,369	2,445	..
Total of Permanent Pasture — For Hay ..	6,380,013	6,077,660	302,353	..
Total of Permanent Pasture — Not for Hay	20,318,216	20,621,079	..	302,863
Total of Arable Land	21,178,585	21,175,630	2,955	..
Corn Crops	9,785,697	9,735,400	50,297	..
Green Crops	4,729,191	4,716,679	12,512	..
Clover, &c., under Rotation — For Hay ..	2,934,783	2,975,094	..	40,311
Clover, &c., under Rotation — Not for Hay	3,044,568	3,051,852	..	7,284
Flax	115,795	133,904	..	18,109
Hops	58,494	63,709	..	5,215
Small Fruit	36,941	* ..	..	..
Bare Fallow	473,116	498,992	..	25,876
Live Stock.	No.	No.	No.	No.
Horses	1,936,702	1,936,925	..	223
Cattle	10,268,600	10,639,960	..	371,360
Sheep	28,938,716	29,401,750	..	463,034
Pigs	3,815,643	3,720,957	94,686	..

* Not separately distinguished.

The usual table prepared for this report, showing the relative course of agriculture in the Counties of England, arranged in two divisions of chiefly grazing and chiefly corn-growing counties, has next to be noticed.

The grazing or western division, it may be explained, includes 21 counties:—Chester, Cornwall, Cumberland, Derby, Devon, Dorset, Durham, Gloucester, Hereford, Lancaster, Leicester, Monmouth, Northumberland, Salop, Somerset, Stafford, Westmoreland, Wilts, Worcester, York (North Riding) and York (West Riding).

The corn or eastern division includes 21 counties:—Bedford, Berks, Bucks, Cambridge, Essex, Hants, Hertford, Huntingdon, Kent, Lincoln, Middlesex,

Norfolk, Northampton, Nottingham, Oxford, Rutland, Suffolk, Surrey, Sussex, Warwick, and York (East Riding).

Although the number of the counties is the same in each of these groups the total acreage is larger in the grazing than in the corn division, in the ratio of 53·7 to 46·3 per cent. of the total acreage under crops and grass in England.

Hence in the acreage under corn crops the percentage proportion of the total for England in the grazing counties is now 37·3 against 37·1 last year, wheat being now 33·3 in those counties compared with 32·5 in 1887. Barley, oats, peas, and rye have all increased in those counties, the proportionate percentage being there 31·4 for barley, 55·1 for oats, 20·0 for peas, and 39·9 for rye, against 31·0, 53·7, 19·8, and 36·3 respectively. In the corn counties potatoes have further increased, and the proportionate percentage is this year 45·6 against 44·0 in 1887.

In the distribution of the total acreage under green crops and rotation grasses there is a decrease in the corn counties, the percentage being now 52·5 against 52·8 last year.

In these counties the percentage of cabbage, kohl-rabi, and rape has increased, the proportion being now 63·3 against 63·0 in 1887. For turnips and swedes and mangold an increase is also shown, the proportionate percentage being now, for turnips and swedes 54·8, and mangold 71·9, against 54·6 and 71·7 in 1887, while vetches, lucerne, &c., have decreased from 71·4 to 70·8 in the present year.

The proportion of bare fallow in the corn counties has increased, the percentage in those counties being 65·2 as against 64·2 in 1887.

In clover and grasses under rotation reserved for hay, it will be seen that the acreage has decreased in the corn counties, the proportionate percentage being there 50·9 against 52·4 in 1887, the percentage of the extent not intended for hay being identical with that of the previous year.

In permanent pasture for hay, the proportionate percentage has however increased slightly in those counties from 38·0 to 38·1 in the present year, that of the quantity not intended to be so used having also increased from 32·5 to 32·6.

As regards live stock, cattle have increased in the grazing counties, the number here this year being 65·3 of the total, and 34·7 in the corn counties, the percentage in 1887 having been 64·9 and 35·1.

Sheep also have increased in the grazing counties, the proportionate number in this division being now 54·4 against 53·9 in 1887. Of pigs there has been an increase in the corn counties, the percentage being 49·1 of the total against 48·5 last year.

The distinguishing characteristics of the cultivation of the two divisions show, according to the figures of the following table, that in the corn counties 34·7 per cent. of the cultivated acreage in that division is now devoted to corn crops and 37·6 to permanent pasture, while in the grazing counties the acreage under corn crops is only 17·8 of the cultivated area of the division, the acreage of permanent pasture being 61·7 of that area.

Comparing live stock with acreage in the three divisions of Great Britain, the returns show that on the 4th of June, 1888, the proportionate numbers of live stock per thousand acres of cultivated land were, in England, of cattle 174 against 186 in the preceding year, and of sheep 632 in 1888 against 660 in 1887. In Wales the proportionate numbers were, of cattle 234 against 246, and of sheep 964 in 1888 as compared with 968 in 1887, while in Scotland there were of cattle 228 in 1888 against 230 in 1887, and of sheep 1380 against 1391 last year.

ACREAGE under CROPS, and NUMBER of LIVE STOCK, in GRAZING COUNTIES and in CORN COUNTIES of ENGLAND, and PERCENTAGES of the TOTALS for ENGLAND, in GRAZING and CORN COUNTIES respectively, in the year 1888.

—	In Grazing Counties.		In Corn Counties.	
	Acreage and Number.	Percentage of Total for England.	Acreage and Number.	Percentage of Total for England.
	Acres.	Per cent.	Acres.	Per cent.
Total Acreage returned under all kinds of Crops, Fallow, and Grass	13,415,913	53·7	11,548,570	46·3
Total Acreage of Permanent Pasture .. For Hay ..	2,554,781	61·9	1,572,881	38·1
Total Acreage of Permanent Pasture .. Not for Hay	5,724,122	67·4	2,764,105	32·6
Total Acreage of Arable Land ..	5,137,010	41·6	7,211,584	58·4
Acreage under—				
Wheat	804,610	33·3	1,614,055	66·7
Barley and Bere	547,300	31·4	1,195,038	68·6
Oats	891,065	55·1	725,279	44·9
Rye	25,574	39·9	38,555	60·1
Beans	73,717	22·9	247,741	77·1
Peas	47,701	20·0	190,277	80·0
Total under above Corn Crops	2,389,976	37·3	4,010,945	62·7
Potatoes	212,575	54·4	178,143	45·6
Turnips and Swedes	629,593	45·2	761,834	54·8
Mangold	98,798	28·1	253,252	71·9
Carrots	3,462	21·6	12,531	78·4
Cabbage, Kohl-Rabi, and Rape	55,367	36·7	95,694	63·3
Vetches, Lucerne, &c.	110,833	29·2	268,758	70·8
Clover and other Grass under rotation .. .. .. For Hay ..	814,984	49·1	844,956	50·9
Clover and other Grass under rotation .. .. .. Not for Hay	652,688	60·0	434,275	40·0
Total under above Green Crops and Grass under rotation ..	2,578,300	47·5	2,849,443	52·5
Flax	1,205	64·9	651	35·1
Hops	9,437	16·1	49,057	83·9
Small Fruit	9,633	29·4	23,143	70·6
Bare Fallow	148,459	34·8	278,345	65·2
Orchards and Market Gardens ..	162,067	63·4	93,750	36·6
Nursery Grounds	4,468	42·6	6,028	57·4
Woods, &c.	786,892	51·8	731,429	48·2
Number of—	No.	Per cent.	No.	Per cent.
Horses used solely for Agriculture	369,437	48·8	387,543	51·2
Ditto, Unbroken, and Mares for breeding	187,670	56·1	146,850	43·9
Cattle	2,840,767	65·3	1,512,059	34·7
Sheep	8,596,234	54·4	7,192,560	45·6
Pigs	1,028,353	50·9	990,067	49·1

A return of silos has again been obtained, from which it appears that the number in Great Britain is now 2667 as compared with 2694 in 1887, while their total capacity is greater by 144,301 cubic feet. It is mentioned that 80 of these silos will not, however, be used this year. In addition to the total number of silos here referred to, 1275 persons say that they propose to make ensilage in stacks. The number of those who stated that they adopted this method last year was 1362. According to some of the reports it is believed that, had the Returns relating to silos been deferred for a few weeks, the numbers given would have shown an increase, but, for the purpose of obtaining this further information closely without delaying the other Returns, a separate collection would have been necessary.

Tobacco.

The experimental cultivation of tobacco in England and Ireland seems to be losing ground. From the particulars obtained through the officers of the Inland Revenue Department, it appears that the quantity of land which has been planted with it in Great Britain in the present year is only 5 acres 1 rood 26 poles and 13½ square yards, a decrease of 13 acres 1 rood and 4¾ square yards from the acreage so occupied last year, while in Ireland there has been only 1 rood thus used.

Sorghum.

The attention of the department having been drawn to the subject of the experimental growth of sorghum as a forage plant, which it appeared, was being resorted to by a few agriculturists in this country, a circular letter has been forwarded to them in order to ascertain, from the results of their experience, its suitability to the English climate.

Consular Returns.

The interesting Series of Diplomatic and Consular Reports received at the Foregn Office, relating to Agriculture abroad, have been made available for the purpose of abstracting information contained in respect to subjects in which it is considered agriculturists can hardly fail to take interest, and the information thus condensed has been issued in leaflet form from time to time to the Agricultural Press and other Journals.

British India.

In respect to our dominion in India a final general Memorandum on the Indian Wheat Crop of the Season 1887–8, issued

by the Revenue and Agricultural Department of India, dated the 6th July last, was received, summarizing the third and final Report on the condition and results of the Wheat harvest of 1887–8, and stating that the estimates relating to the Punjab, the North-Western Provinces and Oudh, the Central Provinces, Bombay and Berar, which, as has been before mentioned, taken together comprise in ordinary years nearly three-quarters of the total area of wheat cultivation in India, may be accepted as fairly accurate. For Bengal, the Native States of Rajputana and Central India, Mysore, Hyderabad, and Kashmir, the estimates furnished in the Reports are less trustworthy, owing to the absence of any organised agency for testing area or out-turn.

In previous publications the estimated or "normal area" under wheat has been roughly taken without alteration at about 26,000,000 acres, with an average out-turn of 7,135,000 tons in accordance with the data published in the "Wheat" Resolution of the Government of India No. 35, A., dated 10th March, 1884. Since then no attempt had been made to revise these estimates; but the subject having been considered at the Agricultural Conference held at Delhi in March last, it was then decided that, so far as statistics are available, the normal area should for the future be the "average of the areas of the preceding five years."

The whole area cultivated in the year 1887–8 is estimated to have been 26,854,882 acres, with a yield of 7,148,628 tons.

In the Punjab the area sown was, as ascertained up to the end of April last, 6,179,800, the estimated normal area under wheat as corrected, so far as statistics are available, being, according to a calculation of the quinquennial average, 6,765,000 acres. The yield is put for 1887–8 at 1,668,506 tons.

In the North-Western Provinces and Oudh, the extent in 1888 was 4,952,354 acres under pure wheat only, and the out-turn is estimated at 1,907,000 tons. The average area so occupied, corrected as before mentioned, appears to be 5,081,500 acres, so that the acreage of the present year is less by 129,146 acres.

In the Central Provinces there were in 1888, 4,601,683 acres under wheat, or 634,683 acres more than the corrected "normal area." The produce of the present year's acreage is estimated at 1,138,800 tons.

In Bombay (including Baroda) the area for 1887–8 appears to have been 3,010,954 acres, the estimated normal area being now 2,871,000 acres. The estimated yield for the present year is given as 862,475 tons.

Berar has an area of 1,052,918 acres, with an estimated out-turn for this year of 154,727 tons. The average area under wheat is now estimated at 855,000 acres.

The latest estimates as to the area and out-turn of Bengal (Behar) and the Native States show that the aggregate estimated area upon which wheat was grown in 1887–8 was 7,057,173 acres, the average total area being now put at 8,285,813 acres. The estimated yield for 1888 amounts to 1,417,120 tons.

The following figures are given in the report as representing the exports of wheat from India to the United Kingdom in the last four years, namely:— 327,249 tons in 1884–5; 603,551 tons in 1885–6; 483,381 tons in 1886–7; 301,985 tons in 1887–8.

The chief falling off in the exports of Indian wheat appears to have been from the Northern and North-Western Provinces, and in explanation of this

decline it is stated that the "true cause of the diminishing export from the western ports in the current year seems to be the short out-turn, not only of wheat, but of other food crops in Northern India. The reports on recent harvests indicate that, both in 1885–6 and 1886–7, there was a material deficiency in the out-turn of important food grains in the north, owing to the untoward character of the weather." In the Punjab, which is the largest wheat-growing district in India, the food-grain harvests of 1885–6 and 1886–7, were deficient on account of failure of the rains, and in the latter year also on account of the severe frosts which prevailed in January and February 1887. "The conclusion to be drawn from an examination of the facts and statistics connected with wheat production and export is, that, whenever there is a material surplus of food-grains in the country, the Indian export merchants can send wheat from India at a price which will enable them to compete at the lowest prices which have yet ruled in Europe, but that when the surplus is small, they are unable to answer a demand even when supported by a rising price in the English market."

The statements here made have, it is said, been confirmed by the receipt of detailed reports which the Agricultural Department in each Province had submitted, and the general conclusions may be summarized as follows:—

(1) There was, especially in the autumn, a deficiency in the out-turn of food grains in many parts of India during the year 1887–8, but not so great as in the two previous years. This was in some parts of India compensated by the generally satisfactory results of the spring harvest of 1888.

(2) In the Northern half of India a considerable falling off in the out-turn of food-crops was experienced for the four successive harvests previous to the spring harvest of 1888. Surplus stocks in Bengal and Central Provinces were drained during 1887–8 for requirements in the North-West Provinces.

(3) These conditions led to a general rise in prices, which culminated in the months immediately preceding the spring harvest, when the prospects were, in consequence of the delay in the winter fall of rain in Northern India, unfavourable.

(4) As soon as the results of the spring harvest were assured by a sufficient rainfall, a decline of prices commenced throughout India, which was entirely independent of the export demand in Europe.

(5) The reports prove that two processes are going on in India in connection with the wheat crop. In those parts of India where there is little room for extension of the cultivated area wheat is substituted for other crops. Where, however, new land is available the wheat area is increased at the expense of other food-grains as well as of linseed and cotton.

In the Punjab, however, wheat already occupies so much of the winter crop area that there is no opportunity for its substitution for other crops, and the extension of wheat growing is due to the expansion of the culturable area, which is being continually done by means of the formation of new canals for irrigation.

The memorandum concludes with the statement "that the existence of a large wheat export is of importance to India in providing what may be termed a safety valve against famine. As soon as any serious diminution occurs in the food stocks, prices go up above the limit at which it is profitable to export wheat, and keep in the country a large supply of food over and above the out-turn of the area originally intended for consumption. If, on the other hand, the European demand were confined to oil seeds, cotton, and other non-edible produce, no such protection would be afforded. From this point of view it is a positive advantage, and not as some have feared a danger, to India that contemporaneously with the growth of facilities for transport, a trade in wheat has been established, and has tended to prevent what would have been a real cause of serious anxiety, the excessive substitution of non-edible for edible products."

For the Dominion of Canada, Returns have this year again been furnished, through the Board of Trade, relating to the Provinces of Ontario and Manitoba. These statistics show that in 1887 the area sown with wheat in Ontario was 1,382,500 acres, as compared with 1,463,800 acres in 1886, the estimated quantities produced being 20,073,700 bushels in 1887 against 27,589,700 bushels in the previous year, the estimated average yield per acre having thus been 14·5 in 1887, whereas in 1886 it was 18·8 bushels.

Barley occupied 767,300 acres in 1887, with an estimated crop of 17,134,800 bushels.

Oats, in the same year, covered 1,682,400 acres with an estimated yield of 49,848,100 bushels.

As regards live stock, the total number of horses in 1887 is given as 575,361, of horned cattle 1,948,264, of sheep 1,396,161, and of pigs 832,817.

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AUSTRALASIA.

With respect to the Australasian Colonies, no information has yet been received from the Colony of South Australia relating to the crops and live stock since the Returns which were furnished for 1884–5.

In the remaining six Colonies the area under wheat at last harvest shows an increase of about 341,800 acres.

In New South Wales the acreage sown under this crop was about 389,400 acres; in New Zealand 357,300 acres; in Queensland 10,500 acres; in Tasmania 40,500 acres; in Victoria 1,232,900 acres; and in Western Australia 29,500 acres.

The total area under barley was 84,100 acres against 73,300 acres in the preceding year, an increase of 10,800 acres.

Oats covered 578,300 acres as compared with about 620,500 acres in the previous season; the larger portion of the acreage so occupied being in New Zealand and Victoria, the yield in 1886–7 being at the rate of 31·2 bushels and 22·9 bushels per acre.

The returns of maize for the same year in New South Wales and Queensland, where this cereal is chiefly grown, show an acreage of 171,600 acres for the former, and 73,100 acres for the latter Colony, with a total produce taken together of 6,585,000 bushels.

The produce of the wheat crop in the six Colonies above referred to amounted altogether to 28,575,600 bushels or an average of about 13·9 bushels per acre. Of this quantity New South Wales produced 4,695,800 bushels or 12·1 bushels per acre, New Zealand 9,424,000 bushels or 26·4 bushels per acre, Tasmania 675,000 bushels or 16·7 bushels per acre, Victoria 13,328,700 bushels or 10·8 bushels per acre, Western Australia 269,600 bushels or 9·1 bushels per acre, and Queensland 182,300 bushels from 7679 acres reaped for grain, or 23·7 bushels per acre.

With respect to the United States, taking winter and spring wheat together, the entire wheat area is very near 36,300,000 acres. In reference to the average of its condition then given, it is added that the condition of winter wheat did not indicate a yield much above 10½ bushels per acre on about 23,000,000 acres, and that the promise of spring wheat was about 13 bushels per acre on 13,300,000 acres.

The acreage of barley is very nearly the same as in 1887. New York, Wisconsin, and Minnesota are credited with a slight increase, and Dakota with a large advance. Iowa, Missouri, and California report a small reduction. "As the yield is larger than that of wheat and the demand greater, there being a deficiency always instead of a surplus, it seems strange that the area of barley should not be largely increased." Its condition which in July was the best since 1885, giving then the promise of a good crop, had declined in the following month from 91 to 89·4. The prospect was still most favourable in the East and on the Pacific coast, condition standing at 93, both in New York and California. Spring rye shared the decline in spring wheat, though on account of its hardier nature the falling off was less marked.

The steady enlargement in the area devoted to oats, which has been one of the noticeable features of American agriculture since 1870, has been continued. . . .

There is an apparent extension of 4 per cent. in the area of maize planted, making the breadth about 76,000,000 acres. The area of wheat ploughed up in several States was planted mainly in maize and oats. The season is said to have been favourable to maize. There was delay in planting in the northern belt, a failure to germinate or destruction of seed by cut-worms in many places, and slow growth in the early season from low temperatures. But some of these drawbacks are always present in some portion of the maize breadth. When the record of general condition was made on the 1st of August it was found to be 95·5, having risen from 93·0 in the previous month.

From the latest Returns of live stock, namely, those in the Reports of January and February 1888, it appears that there were in the United States in 1887, 13,172,936 horses, 2,191,727 mules, 14,856,414 milch cows, 34,378,363 oxen and other cattle, 43,544,755 sheep, and 44,346,525 pigs; showing, as compared with the respective figures of the previous year, an increase of live stock, except sheep and pigs, the decrease in these being 1,214,559, and 266,311 respectively.

A comparison of aggregate values with those of last year shows an increased valuation of over 1,600,000*l.*, cattle and sheep only showing a decrease, while horses, mules, and swine have an increased value. It is believed that the stock interests of the United States are in a comparatively prosperous condition, with a prospect of advance in prices, of cattle especially.

An interest that represents 480,000,000*l.*, and, including horses and other animals in cities not far from 600,000,000*l.*, is one of the very first importance.

24.—*Extracts from the Agricultural Produce Statistics for the Year* 1888.

As these Returns have only reached us on the very eve of our going to press, we must content ourselves with the following reference to the wheat crop of the late season:—

"The figures for the year 1888 show that England produced a wheat crop of 68,159,216 bushels, or 3·83 per cent. less than in 1887, at an estimated average rate in 1888 of 28·18 bushels per acre, against 32·25 in 1887, being a decrease of 4·07 bushels per acre.

"The acreage of wheat in 1888 in England was larger as compared with 1887 by 10·06 per cent. The estimated average rate of production in 1888 in England shows a falling off from the estimated ordinary yield, as obtained in the inquiry of 1885, of 0·76 of a bushel per acre, or 2·63 per cent.

"For Wales the estimated total produce for wheat in 1888 amounts to 1,641,149 bushels, at an average rate of 21·36 bushels per acre, being 0·17 of a bushel below the estimated normal standard. In 1887 the quantity produced was 1,621,957 bushels, at an estimated average yield of 23·37 bushels per acre.

"For Scotland the total produce of wheat in 1888 is shown to be 2,139,282 bushels, at an average rate of 31·12 bushels per acre, as compared with 1,825,888 bushels in 1887, when the rate per acre was 36·27 bushels. The estimated average rate in Scotland in 1888 is less than that of the estimated ordinary yield per acre, by 1·73 bushels.

"The aggregate results therefore for wheat in Great Britain in the year 1888 thus amount altogether to 71,939,647 bushels, as compared with 74,322,747 bushels in the preceding year, the estimated average rate of yield per acre in 1888 being 28·05 bushels, against 32·07 bushels in 1887, showing a decrease in the total production of 2,383,100 bushels, or 3·21 per cent., and a diminution in the yield per acre of 4·02 bushels, or 12·54 per cent.

"The total acreage under wheat in Great Britain was 10·66 per cent. above that of 1887.

"On reference to the Returns relating to the details of counties, it will be seen that of those in England, eighteen exceed the estimated ordinary average production, which, when the character of the season is considered, may perhaps appear remarkable.

"Among these counties, Chester, Cumberland, Huntingdon, Leicester, and Rutland figure with increases of from 3·48 to 5·20 bushels per acre, while others also, such as Bedford, Cambridge, Northampton, and Stafford show augmented yields of from 2·02 to 2·66 over the estimated ordinary average.

"On the other hand, however, among those in which deficiency is shown, the county of Lincoln, with considerably the largest acreage under wheat of any county in the kingdom, appears with a diminution of 2·17 bushels per acre, as compared with the estimated standard average; while Oxford, Berkshire, Hampshire, Surrey, Sussex, Cornwall, Devon, Dorset, Gloucester, Monmouth, Somerset, Durham, Lancaster, and York (North Riding), exhibit decreases varying from 2·12 to 4·49 bushels per acre when similarly compared with the standard."

The Farmer's Library.

NOTES ON NEW BOOKS.

1.—*Journal of the Royal Agricultural Society of England.* Second Series. Nos. xlvii. and xlviii.; vol. xxiv. London, 1888. J. Murray.

THE opening article of this excellent volume, and for all practical purposes the most important scientific contribution for the year, is that by Sir J. B. Lawes, Bart., of Rothamsted, on "The Permanent Wheat and Barley Experiments in Stackyard Field, Woburn." These experiments, commenced in 1877 and continued to the year 1886, may be considered to have struck out a new light in the horizon of agricultural chemistry, and so many important truths have been thereby evolved or confirmed that we have ventured to transfer the article, in a slightly abridged form, to the early part of our present volume (p. 95, *supra*), where it pre-eminently deserves most studious attention.

A paper on "The Conditions of Wheat Growing in India," by Dr. George Watt, and a paper on a kindred topic, "The Indian Wheat Trade," by Mr. W. E. Bear, give much information on a subject which looms in the future as one of our great commercial problems; but in another part of our present volume (Note Book, p. 399) we have already given copious information from the current agricultural returns of British India.

"Modern Improvements in Corn Milling Machinery" are described rather late in the day by Mr. Howard Baker, of Broomhill House, Bristol. The article, which is very carefully written, should command attention in our pages as the production of a gentleman who in time past has rendered great services to the Bath and West of England Society, but a very brief notice must suffice. Sad, however, it is to be told on his high authority that recent improvements and inventions in machinery which have proved very advantageous to the Continental milling trade, have had a totally different effect on the farmers and millers of our own country, closing hundreds of our time-honoured mil[illegible] [illegible] dethroning our home-grown wheats from their former [illegible] preference, whilst there is a decided tendency in favour [illegible] import of foreign-ground flour, in place of wheat requiring to be ground by our home machinery.

It is well known, says the writer, that the new machinery and the new system—

"are not so well adapted for the reduction of native wheats to flour as they are for treating the dryer and harder foreign varieties. If attention be in this place directed to the facts, and to the causes which stand in the way of the more ready use of native wheat in mills possessing equipments of the most recent machinery, it is to be hoped, on the one hand, that mill-owners may be stimulated to adapt their machinery more especially to the manufacture of native wheat, and that the inventive powers of milling engineers may be called upon to second their efforts; while, on the other hand, agriculturists may be led to see the necessity both of producing wheats of a quality and character better adapted than they have hitherto been to the requirements of millers working, as nearly all of them are, under the new systems, and of delivering all wheats in hard dry condition."

Mr. R. Vallentine, Burcott, Leighton Buzzard, discourses upon "The Value of Dung as compared with Artificial Manures"; but the article, though excellent in its way, is so largely dependent on calculations, that even admitting them to be undeniably accurate, the average reader will gladly take refuge in more substantial statements.

In a very excellent paper on "Recent Experiences in Laying down Land to Grass," by Mr. James A. Caird, Northbrook, Micheldever, Hants, the writer states as the result of very careful and extensive enquiry, that the conversion of arable to pasture has not recently been profitable. His figures, derived from the very best authority, show that an increase of 1,688,487 acres of permanent pasture in England, between 1877 and 1888, has resulted in a loss of 4,935,542*l.*; while the great probability is that, with an increase in the profits derived from wheat cultivation, much of the so-called permanent pasture of recent date will again succumb to the operations of the plough, causing "all the worst of the new pastures on good land to be broken up and converted again to tillage, much to the benefit of the country at large." An interesting feature of the paper is the important information derived from a number of experienced agriculturists in the Eastern, Southern, and Western Counties in England, all seeking to make the best of things, though greatly differing in their mode of procedure.

"The general tendency of the replies," says the writer, "is to show what a tedious and expensive task it is to make a really good meadow in the corn-growing countries; in fact, in some stiff soils, or in harsh, dry climates, the labour and expenditure may be said to be almost futile in its result. On the other hand, in favourably-situated portions of the western country, the pastures form themselves rapidly, especially if assisted by manure and artificial feeding of stock. In almost all cases, it becomes evident that whatever seeds are sown, only those survive that are native to the district, and the blanks where the alien grasses have succumbed are in course of time filled up by indigenous herbage.

"The question as to the perennial nature of ryegrass cannot be said to be solved by these inquiries. The opinions are nearly equally divided. Some of my correspondents maintain that it dies out and utterly disappears in two or three years, while others believe either that it is perennial, or that it seeds

itself and so continues. There is, however, a nearly unanimous testimony in favour of sowing it in various quantities in permanent grass mixtures, the object being apparently to secure a crop of some kind while the grasses of more tardy growth are developing."

The article on "Wool and its Uses," by Mr. J. M. Turner, of Bradford, possesses points of interest; but written, as it is understood to have been, by a wool-dealer, it is not surprising that he sometimes appears to overlook the fact that wool to the farmer is of less importance than mutton.

A paper on "Recent Improvements in Cider and Perry-making," by Mr. D. R. Chapman, of Liverpool, will find less favour with the pomologists of Devon and Somerset than those of the West Midlands. It is to be regretted that the long list of apples and pears recommended as specially adapted for cider and perry-making does not seem to have been revised by any one specially acquainted with the productions and requirements of Devonshire, though with reference to other districts much useful information is given. We commend the subject to the consideration of the recently formed Pomological Society, whose head-quarters are at Exeter. Perhaps in our next volume we may be enabled, through the aid of this Society, to furnish a list more faithful and true to the West than anything that has recently appeared.

The article in the second part of the volume which has probably been looked forward to with special interest is that by Dr. Fream on "The Herbage of Old Grass Land." He was induced to enter on the investigation by a desire to ascertain whether there was anything in the botanical composition of certain well-known meadows, in various parts of England, to account for the special quality of the cheese, butter, or other produce derived therefrom. In making this enquiry, Dr. Fream was apparently stimulated by the example of the celebrated William Curtis, who, late in the last and early in the present century, paid particular attention to the subject of grasses. In order to determine the specific nature of the natural herbage grown on the commons of Hampshire and Sussex, Curtis obtained from certain localities in the two counties a turf about six inches in diameter, and grew them in his own garden. The results which he carefully recorded have come down to us in his published writings. Since the time of Curtis and Sinclair, however, "very little exact observation" has been directed to the botanical composition of our grass lands, excepting that within recent years Sir J. B. Lawes has had several pastures submitted to botanical analysis.

Dr. Fream's investigations are therefore well timed, and entitled to every consideration. With well-qualified aid, he was

supplied with seventeen samples of turf from various parts of England, and eight from Ireland, each turf understood to be cut from and typical of what practical men regard as the best grass land of its district. His request to those who assisted him was that each turf should be cut 2 feet long, 1 foot broad, and 9 inches deep, with sufficient of its native soil adhering to permit of its growth for one year at least, without coming in contact with different soil as the result of removal. These turfs were planted in the Botanical Garden at the College of Agriculture, Downton; the first on the 29th of November, 1887, and so on in due course; the beds being kept free from weeds during the season, but the turfs receiving no attention whatever—they were simply allowed to grow, subject to periodical inspection, with careful records of change or development. In the month of July the herbage on each turf was cut; without delay it was separated into its botanical constituents, and the various sections were weighed with the utmost care, and the results recorded. In the paper now under notice, each of the twenty-five experimental turfs has its story told with the greatest care and precision; but space will not admit the insertion of more than two or three samples, which, while illustrating the course and character of the enquiry as a whole, present special features of interest arising from locality or other exceptional causes. The two following turfs (with another, the particulars of which are not here given) were sent through the courtesy of the Marquis of Bath, and the information concerning the lands whence they were drawn is supplied by Mr. H. Fry, his lordship's bailiff at Longleat.

"**No. 22.**—A turf from Webb's Meadows, Longleat, Wilts. This was drawn from grass land at least sixteen years old, which has the reputation of being the best butter-making pasture on the estate. Mr. Fry says the dairymaid can tell when the cows are in this pasture, there being more cream and a different flavour to the butter. When this land is mown the hay requires a great deal of drying. The specimen presented the appearance of a light-brown friable loam. The herbage, cut on July 24, yielded:—

Gramineous herbage	45
Leguminous herbage	3
Miscellaneous herbage	52
	100

The grasses were composed as follows:—

Festuca ovina et var.	57
Holcus lanatus	15
Festuca pratensis	11
Lolium perenne	10
Agrostis sp.	6
Anthoxanthum odoratum / Cynosurus cristatus }	1
	100

The leguminous herbage consisted of Trifolium pratense and Lotus corniculatus. Six-sevenths of the miscellaneous herbage was Plantago lanceolata, the remainder being Rumex Acetosa, Prunella vulgaris, Ranunculus bulbosus, and Cerastium triviale. During growth, the herbage of this plot was seen to be of a very heterogeneous character.

"No. 23.—A turf from St. Alger's Farm, Woodlands, near Frome, Somerset—the Selwood Forest district. The sample was drawn from a celebrated Cheddar cheese pasture. It used to yield excellent cheese, which made the highest price in the district, but the produce has not been so good since the land was drained some ten years ago. The specimen had the appearance of a light-brown loam resting on gravel. The herbage, cut on July 25, yielded the following results:—

Gramineous herbage	88
Leguminous herbage	6
Miscellaneous herbage	6
	100

The grasses were made up in the following proportions:—

Lolium perenne	86
Phleum pratense	10
Holcus lanatus	3
Agrostis sp.	1
Alopecurus pratensis, Poa trivialis	a trace
	100

The leguminous herbage was exclusively Trifolium repens, and the miscellaneous herbage Ranunculus repens. Of the three turfs, Nos. 21, 22, 23, the herbage of this was the greenest, the most homogeneous, and apparently the best.

"No. 25.—A turf sent by Mr. Thomas Nuttall, of Beeby Manor, Leicester. This turf was cut from the famous Stilton cheese pastures in Leicestershire, and the specimen had the appearance of a stiff rich brownish clay, easily drying. The herbage was cut on July 30, and yielded the following results:—

Gramineous herbage	58
Leguminous herbage	42
Miscellaneous herbage	a trace
	100

The grasses were represented in the following proportions:—

Lolium perenne	67
Dactylis glomerata	26
Agrostis sp.	6
Phleum pratense, Cynosurus cristatus	1
	100

The leguminous herbage consisted to the extent of over 98 per cent. of Trifolium repens, the rest being Trifolium pratense."

In similar detail are given the particulars with reference to the 25 turfs experimented upon, and though there is nothing in the botanical composition of any one of them to justify the investigator in arriving at the scientific discovery of the causes

which contribute to the special flavour or other qualities of Dairy produce, Dr. Fream, who had laboured hard to discover truth, in no way discoloured by conjecture, may well exclaim, as he does in conclusion:—

"When it is remembered that these turfs were drawn from twelve English and seven Irish counties, when it is borne in mind that they were selected by men of sound agricultural experience as representative of the best old grass land of their respective districts, and when it is recollected also that each turf continued to grow upon its own soil, then it cannot but be admitted that the general result should be trustworthy. And if there is one fact which, more clearly than any other, is demonstrated in the results obtained, it is the position taken by Ryegrass and White Clover, which appear to constitute the backbone—if I may so express it—of many of our best grass lands."

An attractive and valuable paper is one entitled "Practical Experiences in the Preparation of Food for Stock," by Mr. H. F. Moore, of Frome, who will at once be recognised as the Agricultural Correspondent of the *Times* newspaper. The question propounded for consideration is, In what form can food be most advantageously given to stock? And in order to bring out a record of practical experience on this point, Mr. Moore, as he tells us, addressed inquiries to some 200 well-known agriculturists, asking them to recount their practice and experience as to (1) chaffing, (2) mixing, (3) cooking, and (4) steaming foods. As the answers to these inquiries occupy twenty-eight pages of small type, it would of course not be practicable to transfer them to our pages, but it will interest the reader to know that

"the answers show a general consensus of opinion in favour of chaffing foods. Of the whole of the replies, no less than 70 per cent. show chaffing to be adopted, while in 20 per cent. more it is partially adopted, and in 10 per cent. only is the answer in the negative. The further answers on this question are of the greatest interest, showing as they do how much straw is now used for feeding, only the rough being used for bedding, and where this is also used for food, moss litter is the usual substitute. No less than 46 per cent. of my correspondents use this substitute, and as a rule the remainder either have sufficient straw both for feeding and litter, or else use the rough for the latter purpose. Over the whole of the replies in which prices are given there is a saving of 55 per cent. in the cost of moss litter as compared with the value of straw.

"*Mixed Foods.*—The replies are entirely favourable to this practice, but it is impossible to evolve any very general rules as to what the mixture should be. In this matter the feeder must be ruled by what he has, or what he can best and most cheaply obtain. . . .

"*Cooked and Steamed Foods.*—So far as the economy and usefulness of cooked or steamed foods are concerned, there is the greatest variety of opinion; but on the whole it must be said that there is not so much in favour of the system as there is in favour of chaffing and mixing foods. Sir John Lawes has very kindly sent me a short summary giving the results of experiments on the subject, in which he says:—

"'While the various methods of preparing fodder for animals, such as

steaming, ensilage, &c., &c., may be accompanied by practical advantage, all the experiments hitherto executed show that the *digestibility* is not sensibly increased. It was found by Hellriegel and Lucanus, that the digestibility of rye-straw by sheep was not increased either by fermenting or cooking it. Experiments in Proskau by Funke gave the same results regarding the digestibility of the total dry matter and the cellulose of a mixed ration, fed to milk cows.

"'Recent experiments at Popplesdorf showed decreased digestibility of hay as a result of steaming. Coarse hay fed to oxen, first dry, then steamed, showed a reduced digestibility of all the constituents, but especially of the protein, which was reduced from 46 per cent. to 30. Boiled bran given to oxen was less digestible than dry bran. The digestibility of concentrated fodder is not increased by cooking.'

"In the face of such pronounced results as the above it cannot be claimed for these systems that they make the foods themselves more valuable." . . .

Mr. C. E. Curtis, Professor of Forest Economy at the College of Agriculture, Downton, discourses with much ability on his favourite topic, and in conclusion advocates the establishment of Forest Schools, under the direction of a Board, consisting of the Director of Kew Gardens as Principal, and the Forest Professors at Cooper's Hill as members, with delegates from the Royal Agricultural Society and other kindred institutions, so as to keep the teaching in touch with the requirements of the country.

A very important article on "The Propagation and Prevention of Smut in Oats and Barley," from the pen of that distinguished observer, Mr. J. L. Jensen, of Copenhagen, is contributed through Mr. C. B. Plowright, F.L.S., King's Lynn. As the result of a series of investigations recorded in the seventeen pages occupied by this article, the author arrives at the conclusion that

"dressing cereals with sulphate of copper in the usual manner against smut and bunt causes as a rule a waste of the seed-corn. It is injurious to the plants and unnecessary. Treating the seed-corn with water heated to a temperature of 127° F. for five minutes prevents these diseases equally well, and protects barley much better, while it has the advantage of not injuring the seed-corn or the resulting crop."

Under the appropriate title of "Glimpses of Farming in the Channel Islands," Mr. W. E. Bear contributes a very interesting article, from which we glean the following particulars:—

In Jersey the production of other early vegetables than potatoes and of fruit is an important industry, though in comparatively few hands. On the other hand, the growth of apples, pears, and other outdoor fruit is rapidly diminishing. . . . The apple orchards have been greatly neglected of late, and are fast disappearing. They are now chiefly valued for the making of cider. Pears, for which the island has long been famous, are still grown to a limited extent, but many fruit-growers have done away with their pear trees to make room for glass-houses.

"Small farmers in Jersey do not, as in Guernsey, build glass-houses for the

production of early fruit and vegetables, and that branch of industry is chiefly in the hands of a few extensive growers. One of these, Mr. George Bashford, of St. Saviour's, is deservedly famous as one of the most successful managers of glass-houses in the world. . . . He has now nearly thirteen acres of land occupied with glass-houses, and the borders necessary for the vines in most of them, and the heating pipes he uses measure about fifteen miles in length. .

"Guernsey land, with all due allowance, as a whole is not as highly farmed as that in Jersey. When we come to the glass-houses, however, we have an 'intensity' not touched in Jersey by the small farmers. In some parts of Guernsey nearly every farmer, as well as many a mechanic or other workman, has at least one glass-house, and many have several of these structures.

"*Broccoli* is now one of the most profitable of the crops grown in Guernsey, and it will be noticed that it takes an important position in the new course of cropping, while wheat is left out."

"Fruit Evaporation in the United States of North America" affords an opportunity to Mr. D. Pidgeon, Holmwood, Putney Hill, S.W., of explaining the remarkable extent to which apple growing and fruit evaporation, more especially in parts of Massachusetts, has superseded the growth of wheat. The evaporator or fruit dryer, an example of which was shown at the Nottingham meeting, is an arrangement of the simplest description, consisting of an upright stove, fitted with sliding wire trays, on which the fruit is laid and subjected as long as thought desirable to the regulated influence of fire or steam, in proportion to the size of the apparatus.

"Western New York"—we are informed—"was formerly the granary of North America, and Rochester was a city of mills. All has changed with the introduction of Western wheat. Wheat-fields have become orchards; the mills, once thickly lining the banks of the Genesee River, have disappeared, or become factories. Throughout twelve of the most fertile counties of Western New York, the cultivation of fruit, especially of apples, has, within fifteen years, superseded that of every other crop. The orchard products of New York State were valued at nearly nine million dollars in 1880, the last census year, and will probably be worth far more in 1890. The greater part of these apples are grown around Rochester, where, within a radius of forty miles, nearly two thousand fruit-drying establishments are now in operation.

"Only by the aid of these 'Evaporators' could such a condition of cultivation as that now prevailing in the district under review be maintained. Thousands of tons of apples are prepared annually from grades of fruit formerly wasted or allowed to rot on the ground. The fruit-drier and the extension of fruit-farming have gone hand-in-hand, and, following naturally upon their union, the dried-fruit merchant has appeared, and flourishes. He does not himself evaporate fruit, but buys both from evaporating establishments and the farmer, packs for export, and exploits the whole world for markets. . . .

"Glancing, first, at general facts indicating the character and extent of this new industry, 1500 evaporators were at work in the neighbourhood of Rochester during the year 1887, and some 150 more were started during 1888. These range in capacity from 25 to 1000 bushels of apples per day. The 1500 evaporators in question gave employment during the autumn and winter of 1887 to 30,000 hands, who earned from 5 to 12 dollars each per week, according to skill and experience. The total quantity of dried apples produced was about thirty million pounds, and their value two million dollars. Five million bushels, or 250 million pounds of green apples, were required for

this purpose, from which more than 200,000 tons of water were driven off by the consumption of 15,000 tons of coal.

"The product finds a market all over the world, but the chief consuming countries are Germany, England, Belgium, Holland, and France. Evaporated apples are packed in cases each containing 50 lbs., and the cost of carriage per case to Liverpool is 30 cents, or 1*s.* 3*d.* The same quantity of green fruit sent in barrels would cost $2.50, or 10*s.*, and canned fruit $2.10, or 8*s.* 9*d.* In the case of evaporated fruit no damage is done, even by the longest transit, while fresh fruit suffers enormously, and canned fruit is always liable to ferment.

"The refuse of the apples, consisting of cores and parings, is not lost, for these also are dried, and form the basis of all the cheap jellies now so largely manufactured. Twelve millions of pounds of dried cores and parings were exported from America during the year in question. Sliced apples, dried without coring or paring, are exported in large quantities to France, where they are used in the production of the cheaper wines, and, sometimes, by the distiller. Eighteen thousand barrels, containing four million pounds of sliced apples, were sent to France during 1887, and ot this quantity more than half was furnished by the Rochester Evaporators. The dried apples of Western New York can now be bought in almost every town on the Continent of Europe, while an increasing demand for them is springing up even in such remote parts of the world as Australia and Western Africa, whilst at Rochester it is the practice to dry not only apples, but peaches, plums, and raspberries."

Among other articles deserving of attention may be mentioned Feeding Experiments conducted at Crawley Mill Farm, Woburn, in the winter of 1887–8, by Dr. J. A. Voelcker; Barley from a Maltster's Point of View, by Mr. R. Free, Mistley, Essex; and a masterly treatise on the Structure of the Horse's Foot, very freely illustrated by Professor G. T. Brown, Principal of the Royal Veterinary College, which it is to be hoped may be printed in a cheap form for distribution. Our notice of the volume would, however, be incomplete without allusion to the brief *In Memoriam* references to the late Charles Randell by Mr. Dent, as also by the Secretary to the late J. C. Morton, J. A. Clarke, and John Coleman, three distinguished contributors to the literature of the Royal Agricultural Society and that of the Bath and West of England Society also.

—*Journal of the Society of Arts.* Vol. xxxvi, Nos. 1864, 1865, 1866. London: G. Bell and Sons.

THESE three weekly numbers of the 'Journal of the Society of Arts' contain reports of the Cantor Lectures delivered in April, 1888, by Mr. Richard Bannister, F.I.C., F.C.S., on the subject "Our Milk, Butter, and Cheese Supply." The lectures form an admirable and able *résumé* of the important questions of which they treat; the wide subject of dairy products being dealt with in a lucid and compendious style, while all the most

reliable authorities are drawn upon for the purpose of presenting the scientific side completely.

The first lecture deals at the outset with the relation of the State to the dairy industry of the country, and with the composition and sale of milk.

The production and composition of milk are then dealt with, and the following description of the method of analysing milk is given :—

"Ordinary milk analysis consists in the determination of the original gravity of the milk, the quantity of solids it contains, the proportion of fat present, and the amount of mineral matter left on ignition. There is considerable difficulty in separating the fat absolutely, and this difficulty has led to much of the disagreement which has arisen on the subject of milk analysis. It is apparent that, as the total solids of milk are divided into 'fat' and 'solids not fat,' if the whole of the fat is not removed the residue of 'solids not fat' will be too high. The solvent used for separating the fatty matter is ether or light petroleum spirit. Each of these liquids is a perfect solvent if brought into direct contact with fat; but in milk the solid matter to be operated on is so tough and compact, that it locks up the fat, and it is therefore necessary to get it, in some way or other, into a porous condition that the spirit used may dissolve out every particle of fatty matter. The mode of obtaining this porous condition is practically the groundwork of the different systems of milk analysis. The primary and most obvious method was to reduce the solids to powder by manual labour. With this intention, ether or petroleum spirit is poured on to the partially dried mass of milk solids, and by constant grinding with a glass rod the mass becomes pulverised. By constant application of further quantities of the solvent, and repeated grinding, the whole of the fat is at length removed, and the solid matter left behind can be dried and weighed, which is the 'solids not fat.' The spirit having the fat in solution is slowly evaporated, and at last the fat becomes dry and is weighed. The two weights should together make up the 'total solids.' Chemists have tried to get over the tediousness of the process described by putting into the milk weighed quantities of gypsum or pumice-stone, which has the property of dividing the particles of milk, and allowing the solvent to take out the fat. In either case the 'solids not fat' cannot be weighed, and the check on the working is not therefore perfect. The operations have the advantage of reducing the mechanical labour of the analysis, and the analyst is able to proceed with several analyses at the same time. This saving of time is of considerable importance in the analyst's work, for the fees allowed under the Adulteration Acts are so small that they are barely remunerative, and he has consequently to study the quickest and cheapest, though perhaps not the most exact, methods of analysis for the examination of ordinary samples. A coil of unglazed paper has recently been used for absorbing the milk, and leaving it in a divided state for the action of the fat solvent, but there are objections to its use which are too technical to be exhaustively treated in a popular manner. And here it need only be said that the 'solids not fat' cannot be weighed when this process is employed."

The second of the lectures deals chiefly with the butter-supply.

With reference to sweet *versus* sour cream for butter-making, on which much debate takes place, it is stated that "sweet cream, when made into butter, does not yield so well as cream

slightly soured; and as the Danish cream, both skimmed and separated, is sweet, it is soured by being brought to a temperature of 62°, and the addition to it of ½ to ¾ per cent. of sour butter-milk." Probably soured cream may, as is said, yield better, but the extra quantity is perhaps obtained at the expense of the delicacy of flavour.

The third lecture contains a useful summary of the methods of making the chief kinds of British cheese, as well as some of the Continental kinds which find a sale in this country. The following remarks on the foreign competition in this respect are to the point:—

> "The description of cheese imported from America is Cheddar, or Cheddar loaves. This cheese is dry, and fairly tough and hard, and as a Cheddar cheese weighs about 70 lbs., it is very suitable for being produced at large dairies or in cheese factories.
>
> "Dutch and French cheese are fairly uniform in character; but during the last ten years the soft descriptions of French cheese have become more in demand, till at last, on account of the profit made on these descriptions of cheese, our farmers are trying to make them at home. American and Canadian producers are at the present time benefiting by the low ocean freights. In February of this year, the cost of freight from New York to Liverpool in line steamers was for cheese, 4·80 dollars a ton, and for butter, 6 dollars, which is equivalent to one penny for 10 lbs. of cheese, and the same sum for 8 lbs. of butter. Freight is, therefore, nominal only, for higher rates than these are charged for the ordinary carriage of butter and cheese from one district to another in Great Britain. These countries, although thousands of miles away, are consequently very close to us in cheese competition; the telegraph commanding the market, and the steamers bringing the cheese in excellent condition to be stored here till required."

Most of the information contained in these lectures may, of course, be found in the standard works on the subject; but it is not often that the student will find so many reliable data gathered in so small compass, or presented in so careful and interesting a manner.

3.—*Rural-School Education in Agriculture* (*Scotland*), being the Opening Lecture delivered in the University of Edinburgh, on Monday, 3rd September, 1888, to a Special Class of Fifty Rural-School Teachers, supported by a Treasury Grant of 300*l.* By ROBERT WALLACE, Professor of Agriculture and Rural Economy. Edinburgh: Oliver and Boyd, Tweeddale Court.

Now that the Government has it in its power, under certain conditions, to make grants in aid to deserving Agricultural and Dairy Schools in Great Britain, attention naturally turns with interest to authentic details of any special grant, and to the

mode in which it is intended to be used by those entrusted with its application. The grant to the University of Edinburgh, under the circumstances stated on the title-page of this Lecture, is a case in point, and notwithstanding existing differences between the systems of popular education, north and south of the Tweed, deserves careful attention.

The Chair of Agriculture in the University of Edinburgh was founded in 1790, very nearly 100 years ago, and it certainly was a novelty in its history to have the Agriculture Class-rooms filled, as they were on the 3rd of September last, with "rural school-masters hailing from almost every county in Scotland." The object of this assemblage was to hear from Mr. Wallace, Professor of Agriculture and Rural Economy, his opening lecture on how it had been found possible to form and bring together a special class of educated, and presumably well-disciplined school teachers, 50 in number, whom it is hoped to train and hereafter to utilize as experts or teachers of agriculture in the rural schools of Scotland.

"I feel personally responsible in the matter," said the Lecturer, "and I shall make it my endeavour to give some explanation of the circumstances which led up to the existing position, and roughly sketch the future prospects of the undertaking as time develops and expands it, and as its success calls forth the sympathy and support of those who may at this juncture feel dubious of the results."

Time was, and that not very long ago, when the scheme propounded would have been not only doubtful but impossible. As no want had been expressed, no aid was forthcoming. The average farmer rather scouted than encouraged the idea of scientific training for himself or his sons; and it was not until adversity had taught the farming community at least one salutary lesson, that for want of technical training they were being overmatched in the race of foreign competition, their cry was raised, heard, and attended to. Even now the scheme, though highly ingenious and plausible, may in some quarters require further explanation, in others possibly provoke opposition. It is therefore but fair to let the Professor speak for himself.

"I want it to be understood," he says "in the most unmistakable manner, that it is not the belief of any of the promoters of the scheme for the education of teachers, who will teach agriculture in schools, that schoolmasters will ever be converted into farmers or become qualified to instruct farmers or their sons in the actual practices of husbandry. Teachers are not to be transformed into farmers in the course of a few weeks by a magic wand. It is intended merely that they should, by building on the foundation of a good general education, become literary experts in the subject of Agriculture, and be able to direct the youthful mind in proper grooves: above all, to encourage the development of the power of observation, for which there is so much necessity as a training for every walk in life, and so much scope and material constantly at hand in a country place."

Then, with reference to their future occupation and engagements, the members of the special class are distinctly told :—

"The classes which you will conduct on your return home are intended to supply the indicated want to the Agricultural populations. I shall rejoice to see the time when farmers' sons and labourers' sons alike will take an intelligent interest in all objects which come before their eyes, and have the means within their reach of solving difficulties as they appear. The advantage to be reaped is a double one. Not only would the information be of use to them in after life, but the power and habit of observation would grow with the accumulation of knowledge. Observation is like any other faculty—it can be cramped by misuse or dwarfed by neglect."

If the importance of this faculty of observation needed any illustration or enforcement, nothing, said the Professor, struck him more forcibly during his travels in India last year, than the extraordinary amount of knowledge relating to all sorts of details of their surroundings possessed by the native agricultural population.

"One could not find a plant or creeping thing, injurious or otherwise, that had not a local name with more or less of a history attached to it, and which was not well known to the masses of the people. Nothing seemed to escape observation that could be seen, whereas nothing could be more completely the reverse of the case than the state of matters among a corresponding section of the community in this country. It is a regrettable fact too," continued the Professor, "that the present generation is more profoundly ignorant than preceding ones. It is pretty well established that about the beginning of this century farmers had a much better knowledge and appreciation of the natural pasture grasses of the country than is possessed by farmers of our time."

So much for the cultivation or neglect of habit of OBSERVATION ; but the advantages of the new departure are not thus to be summed up or dismissed. There are in the Professor's opinion numerous "generally accepted agricultural principles which can be explained and may be discussed," besides the "results of valuable experiments which demand consideration and attention." So far, so good : the reader will have little difficulty in assenting to the leading features of the scheme described, but with all respect for the talents and experience of the Professor as a teacher, it is to be feared that the following paragraph implies a larger amount of confidence in the capacity and integrity of his pupils, than at all times certain to be found where the removal of observation and restraint gives full play to the temptation of free and easy dogmatic assertion :—

"I believe," says the Professor, "that an immense amount of useful elementary knowledge can be disseminated by school teachers if they will confine themselves to principles, leaving the practice entirely to those who have spent their life in it. Where a doubt exists, it should be the duty of teachers to state both sides of the question, and they should at all times rather convey information from acknowledged authorities than personally advise from their own opinions."

To the question why rural school-teachers have been selected for the work, the answer is boldly given that their employment has many conspicuous advantages.

"To begin with, it is within the range of possibility to do so with the means at our disposal. We have in them educated men who are in direct touch with, and in convenient reach of, the very classes we want to influence; we have, further, men who are trained to impart instructions. All that is really wanted under these circumstances is an assurance that the teachers are themselves instructed in the work laid out for them."

This, the Professor contends it is possible to do, if too much is not expected, whereas he has on former occasions pointed out that

"even in the higher Agricultural Institutions where every appliance is provided it is impossible in conducting the education of farmers to carry out a thoroughly systematic scientific course, and combine with it more than a very limited amount of practical work, which in reality assumes a position of no importance. This is the conclusion arrived at not only in our home institutions, but also those in the United States of America, and in Canada. . . . I have no hesitation in saying, I am fully convinced that if there were any elaborate attempt made to get schoolmasters to teach practical Agriculture in Scotland, it would not only end in failure, but injure the chances of that success which I feel assured will attend their efforts in teaching scientific principles. . . . In short it has been found in every instance where it has been fairly tried, that parents who are employed in agricultural pursuits feel (and I have no doubt they are perfectly right) that they themselves are the best instructors of their own children in matters of manual labour, which, when properly directed at home, is worth something; but work without an incentive (such as wages or a personal interest) must be performed as a drudgery, and in a perfunctory manner. To work satisfactorily and comfortably, a man or a boy must get into training for it, by continuing steadily at its performance."

As for experiments in rural schools, we are told that if kept within moderate bounds, with a definite object in view, they might in some cases do good; but to the thoughtful reader it will at once occur that experiments in education (school or college) are not to discover new truths, but to illustrate what is already known, and to put the learner into the attitude of intelligent enquiry. In like manner the allotment system finds no place in the scheme, but it is tacitly condemned as a return to spade labour.

To the question whether he considers the course of Agriculture and Chemistry on which the special classes are entering sufficient and in all respects satisfactory for the object in view, the Professor emphatically replies:—

"My answer is decidedly, No; but it is the best we can command, and I humbly submit that it is a decided improvement upon previously existing circumstances. Granting, for the sake of argument, that the South Kensington training is the best possible, so far as it goes, for English teachers, there could be no better reason adduced in support of its perfect unsuitability for Scotland."

Such are the Professor's views with reference to the immediate present, but he looks forward, merely as a matter of time, to the establishment of a really full and satisfactory *curriculum* of agriculture for rural school-masters during the three years, instead of two as now, wherein they are passing through the Normal School.

With a word of censure for many of the existing agricultural text-books, issued from the press by unqualified teachers, the Professor propounds as an integral feature of his scheme, the establishment of rural libraries—250 to begin with—in every part of Scotland; the books to be procured on easy terms from the leading publishers and Agricultural Societies in Great Britain, and the rural experts or teachers of agriculture to act as librarians as well as students. The interest attaching to the subject, and the earnest ability with which the Professor is applying himself to the important work described in his Lecture, fully justify the space allotted to its consideration. It is pleasant to know that the Professor is fully *sustained in his work by* the confidence and general approbation of the Scotch farming community.

4.—*Norfolk Chamber of Agriculture. Report of Experiments,* 1888.

THE Field Experiments carried out by the Norfolk Chamber of Agriculture have already obtained wide repute. This is perhaps in some measure attributable to the fact that they evolved at the first outset some distinctly sensational facts, but it is scarcely less due to the eminent skill and judgment with which they have been conducted, and to the steadfastly practical spirit in which they have been undertaken. The stamp of public approval has been fittingly placed upon the work by the well-merited grant by the Government of 150*l.* in aid of the experimental operations of the Norfolk Chamber of Agriculture.

The Report issued in January 1889 is so full of detail, and its value necessarily depends so largely upon the tables of figures which record the results, that it is hopeless to expect that any adequate idea of the facts which it contains can be given in the brief summary to which conditions of space here restrict us.

The experiments were divided into two sections, viz., (1) Feeding, and (2) Field. The first part deals with an enquiry into the respective merits of several feeding stuffs for fattening sheep. This is a subject which, as the Report recognises, is attended by special difficulties when conducted by an associa-

tion which does not possess an experimental station and staff. In this case, however, the kindness of Mr. Garrett Taylor enabled the trial to be made on his farm, and with his sheep. Seven pens of sheep, each containing eight, were put up and weighed on January 31st, and at various periods until April 28th, when the trial terminated. The sheep were folded on swedes (the roots being sliced) and had a daily allowance per head of ½ lb. of clover and rye-grass hay. The provision of roots was unlimited, and it was found that the average consumption was 16 lbs. per head per day. The sheep were ewe tegs (about 11 months old) of the Southdown breed. The object of the experiment was to test the feeding value of cake and corn, and of different kinds of cake. It was intended also to throw some light upon the value of oil in linseed-cake, but the trial in this respect was vitiated by accidental circumstances. Down to March 5th, each sheep had daily ½ lb. of the added food, and thereafter to the end of the experiment the allowance was ¾ lb. The details and results are set out fully in about 15 pages of the Report, but the salient points can be most concisely indicated here in tabular form :—

Pen.	Food.	Average weekly gain per head.	Nett cost per lb. of increase (live weight).
		lbs.	d.
I.	Whole wheat grown on the farm	1·4	1·70
II.	Decorticated Cotton-cake and grittled barley (equal parts)	2·1	·90
III.	Linseed-cake (13 per cent. oil)	2·0	1·02
IV.	Linseed-cake (10 per cent. oil)	1·9	1·06
V.	Linseed-cake (10 per cent.) and Malt-sprouts (equal parts)	1·8	·36
VI.	Linseed-cake (10 per cent.) and undecorticated Cotton-cake (equal parts)	1·7	·90
VII.	A patent Lamb food	1·9	1·24

The patent lamb food was only introduced for local reasons, and as its constituents are unknown, and its name unmentioned, it may be eliminated for general purposes.

It will be noted that No. II. pen came out best, although from a pecuniary standpoint No. V. pen was fed the most cheaply. The value of decorticated cotton-cake and barley, as an effective substitute for the more costly linseed-cake, is clearly shown, and is a lesson which stock-keepers would do well to bear in mind. Both the wheat and barley were reckoned at 30*s.* per quarter, 2*s.* per qr. being added in the case of the latter for grinding. While the use of barley, at present prices, is thus vindicated, the experiment with wheat was disappointing, as it came out

worse than any other food. This is in opposition to the remarkable results lately obtained at Woburn, by feeding whole wheat to sheep. The present Report states that, in view of the results now obtained, it is not proposed to continue the experiment with wheat, a conclusion which seems a little hasty after only one season. It will be observed that the two samples of linseed-cake gave very nearly identical results. The test as to oil was not satisfactory, as the richer cake was not pure, and the poorer cake was not particularly poor. According to the prevalent standard by which 2½ per cent. of albuminoids are reckoned equal to 1 per cent. of oil, the latter was, by analysis, the best sample, as it contained 10·23 per cent. of oil, and 33·19 per cent. of albuminoids, as against 13·43 per cent. of oil, and 23·87 per cent. of albuminoids in the richer cake. So far as it goes, therefore, it tends to throw doubt on the aforesaid standard.

We are left without space to refer to the experiments on crops which were continued mainly on the lines of previous years. We must refer readers to the Report, which will amply repay study. It may be noted that the Massingham Break field on which potash gave such sensational results in 1886, was now under barley, swedes, and green round turnips on the plot which had received no potash at all. Again no potash was supplied for these crops, with the result that the barley and swedes practically failed, while the green round turnips, curiously enough, went away and came to quite a heavy crop for the land. Each crop had a dressing at the rate of 3 cwts. superphosphate, and 2 cwts. nitrate of soda per acre. One remark made in the Report is worth quotation and attention. The writer refers to the "increased practical interest which is added to our experiments by the plan of taking a portion from the main area of the field, as farmed under the ordinary routine, and side by side with the designedly experimental plots, for accurate test and comparison with them." This is a plan which might be commended for adoption to all agricultural experimentalists.

*** In connection with the proceedings of the Chamber, it may be mentioned that on the 5th of January the Members had the advantage of hearing a paper on "Butter-making in Denmark," read by Mr. S. Hoare, who spoke with the interest and authority derived from actual observation, and whose remarks in their printed form are calculated to be very useful. The Dane's motto, "One for all and all for one," is suggested by Mr. Hoare as well adapted for the farmers of England.

5.—*Annual Report of the Proceedings of the Sussex Association for the Improvement of Agriculture.*

I HAVE received, as a contributor of a small pecuniary donation, the Report to the Committee of the Sussex Association by Mr. Jamieson.

I feel bound to take on myself singly the responsibility of noticing it in our Journal. Sussex is within the district of our Society, which includes the Southern Counties. The Association has received public recognition in the Report of the Departmental Commission, presided over by Sir R. H. Paget, one of our Vice-Presidents, and subsequently by a grant of 50*l.* from the Privy Council for conducting useful experiments in Agriculture (Lord Cranbrook, the President of the Council, speaking of himself as feeling a personal interest in the Association, and subscribing to it). Mr. Jamieson and the Association may be heartily congratulated on this recognition of their work.

But the first and strongest feeling must be one of deep regret for the irreparable loss sustained by the death of Major Sergison, who is commemorated as the founder of the Association, and to whose enthusiasm it owed so much.

I can most sincerely say that I have entered on the task of commenting on this Report, with an earnest desire to gather from it instruction for myself and others; I have read it, and studied it over and over again with no controversial disposition; because I know that (owing to causes to which I need not again refer), while some persons may overrate the supposed novelty of the recommendations of Mr. Jamieson, or the practical value resulting from following them, others hardly do full justice to the energy and diligence which has accumulated a number of tabulated facts; or the benefit conferred on the county of Sussex by awakening local interest in principles of manuring which had not previously penetrated through the obstructive prejudice and routine which prevailed locally.

But I must confess that having in former years served my apprenticeship to the study of Aberdeen and Sussex diagrams and tabulated statistics, I am this year more than ever unable to grasp the premises, the principles, or the conclusions of the work, whose author claims for it a superiority to former "desultory" agricultural investigations, and to "powerful misconceptions," in contrast to the present "uncompromising enquiry." When one recalls the work done by Sir H. Davy, Johnston of Durham, Liebig, Lawes, Gilbert, Warington, and Voelcker, not to speak of Boussingault, Stockhardt, and other great continental investigators, one must remember that those who strike out a path for themselves without fully recognizing and using all that has

been done already, may not be turning their zeal to the best account.

The present Report deals with drainage, liming, manuring, and grasses. Each of the first two subjects seems treated as *res integra*, as untrodden ground, on which there is nothing certain except the prevalence of prejudice and ignorance, and as if one field on Harvest Hill looking over a beautiful view to the Sussex Downs could throw some special light on the unknown. It is, however, admitted that, as regards drainage, wetter ground should have been chosen; but still the final verdict is thus given, "that so far as we can judge by these results, it may be said that in the case of grass land, except in cases of extreme wetness, there seems to be little temptation to risk outlay on drainage;" however, a saving clause is added that there is "need for confirmation, independent and multiplied tests on a uniform plan." The subject is further pursued with reference to grain crops and roots.

The *Effect of Lime on Pasture* is again dealt with. It is again recorded "that smaller crops have been reaped when lime has been applied than when it has been withheld." An elaborate diagram is given which is said to "show how uniformly on the small (or more accurate) plots the effect of lime has been slightly to *increase* the crops the first year, and to more markedly *decrease* the crops in the three succeeding years." It need hardly be observed that this, on both points, is the reverse of Western experience, which allows that lime may check vegetation for one year, but does not doubt that it generally improves the quality and quantity of pasture afterwards. A saving clause here follows as to the need for more extended observations, and reference is made to small experimental plots as to the effect lime may have on clay; but 2 tons per acre are said to be in such a case only "playing with the difficulty," 4 tons or rather 6 tons per acre are suggested.

Manuring generally.

I come to a subject on which I seem to see some tangible information.

To begin with, I may call a practical rather than theoretical [illegible]tness. Sir John Lennard, a member of our Council, told Lord [illegible]anbrook at the deputation to the Privy Council, "that his [illegible]perience had been on a large scale, the first being on a field [illegible]f oats. He had put on that field dressings recommended by [illegible] Jamieson at a cost of 22*s.* or 23*s.* an acre. The effect [illegible] quarters to the acre, and the straw was 4 feet high." [illegible] the unmanured land was not stated.

On the visit to the Experimental Stations, June 26, 1888, a letter was read by Major Sergison from Mr. Allen, of Ballenhurst, Ticehurst, stating that on using Professor Jamieson's manure, he had obtained [in 1877 presumably] seven quarters of wheat. Mr. Allen also states (in answer to doubts expressed by me in 1886) that he had produced 46 cwt. of straw per acre. The crop (of Scholey's Squarehead) was 44½ bushels on 4½ acres *after hops.* His object was to show that Mr. Jamieson's quantity of straw, which had been questioned, was not impossible. I put these practical testimonies in the foreground. I now turn to experiments — and these experiments on a most important point to which I have devoted some attention with scanty results.

Effect of Manure on Pasture.

Here I find it very difficult to follow the Report into detail, after a most diligent examination of the tables. I can only give the statement in the Report.

" The increase by the best form of manure over the unmanured plot is not merely a little more, but actually a half or even three-fourths more. Year after year this is what has been experienced more or less distinctly. Without therefore giving the details for each year . . . it may be sufficient to mention that by applying to old pasture concentrated manure this year, 11*s.* 3*d.* per acre, or averaging the doses for the past five years, 23*s.* 8*d.* per acre, there has resulted, on an average, an extra ton of hay yearly, the value of which cannot be put at less than 60*s.*"

The following figures are given :—

		Old pasture. Cwts. per Acre.
Average crop for 5 years	No manure	25
	Concentrated manure .	46
	Increase . .	21 cwts., or 84 per cent.
Average crop for 3 years	No manure	34
	Concentrated manure .	60
	Increase . .	26 cwts., or 76 per cent.

As far as I can make out, the concentrated manure here referred to is a mixture of reasonable quantities of nitrate of potash, nitrate of soda, superphosphate, and steamed bone-flour. I see nothing special in this receipt beyond what was recommended many years ago by Sir H. Meysey Thomson. It cannot be suggested that the substitution of ¼ cwt. of nitrate of potash, an expensive form of potash, for a fair dose of kainit

constitutes a specially scientific prescription, to which a great practical difference is to be attributed. I wish I could say that I had found any very practical result from such a mixture on good grass-land. I think it would be well worth while for our Society to try to set on foot experiments with artificial or concentrated manures on poor pastures. But for reasons partly, and very fairly, stated by Mr. Jamieson, it is very difficult to put experiments on pasture to a satisfactory test. Mowing and hay-making is not enough; grazing is very difficult to manage so as to give true results.

After what has been said on drainage and manure, a curious passage follows in the Report headed *As to Dung.*

"It is doubtful how far the recognition of dung as a manure is correct, and whether it should not be regarded mainly as acting more *mechanically* than as a feeder of plants. If that be the case, then its application should be made in such *a way as to assist its mechanical action.* That is to say, instead of merely spreading it on the pasture, in the hope that the plant food which it contains will be washed into the soil like an ordinary manure," [what is an ordinary manure?] "and that such washing will take place before its more volatile part is volatilized by the heat of the sun [!!] it may be more correct to regard it as a kind of rich superficial layer of soil, and to use the best means to quickly incorporate it with the soil; also to accept as inevitable a poor result, should it happen that the season is such that the dung becomes so dried up as to prevent this incorporation, and consequently to render it unable to perform its mechanical functions."

This subject of dung was very fully treated by Dr. Voelcker thirty years ago.* I have frequently referred to his paper as proving that neither sun nor rain would waste the volatile elements it may contain. But looking at the article again, I am bound to confess that I have not found a distinct negative of the action of the sun in dissipating the volatile constituents of dung; though, unless my memory deceives me, I learned from him distinctly that the sun, by drying the manure, iscourages fermentation, and causes no loss.

Anyhow, he clearly proved that without fermentation there ould be no such loss. His experiments, which were most laborate, extended over nearly twelve months, dealing with ung in all its stages, and under various conditions. The Re-rt extended over more than sixty pages and contains reports lmost as many analyses. There can be no doubt as to his nion that dung contained the *food of plants.* He says,

* Roy. Agr. 'Journal,' vol. xvii. 1856.

"Farmyard manure is a perfect manure, because experience, as well as chemical analyses, shows that the fertilizing constituents are present in dung in states of combination which appear to be especially favourable to the luxuriant growth of crops." * He does not lose sight of the *mechanical effect of dung.* He says it is especially important in reference to heavy clay soils. But he says that fresh dung contains soluble and insoluble nitrogenized organic matters in four different states, and rotten dung in several other states, and that this complexity of composition, difficult if not impossible to imitate by art, is one of the reasons which render farmyard-manure a perfect as well as an universal manure.

In his summary of conclusions we find the following statements:—

(6.) "The most effectual means of preventing loss in fertilizing matters is to cart the manure directly on the field whenever circumstances allow this to be done."

(7.) "Since active fermentation, and with it the further evolution of ammonia is stopped by spreading out the manure on the field, valuable volatile manuring matters cannot escape into the air by adopting this plan.

"In the case of clay soils, I have no hesitation to say that the manure may be spread even six months before it is ploughed in, without losing any appreciable quantity of manuring matters."

(12.) "Properly regulated, however, the fermentation of dung is not attended with any great loss of nitrogen nor of saline mineral matters."

(13.) "During the fermentations, ulmic, humic and other organic acids are formed, as well as gypsum, which fix the ammonia generated in the decomposition of the nitrogenized constituents of dung."

(14.) "The phosphate of lime is also rendered more soluble than in fresh dung."

I have thought it might be interesting to readers of the Sussex Report to read also these selections from the twenty-five conclusions in which Dr. Voelcker sums up his work of research and experiments.

This treatment in the Sussex Report of the subject of Dung is one of those passages which make one almost despair of any result from what is called agricultural research. The writer of the passage in the Sussex Report cannot have carried research so far back as to be aware of the late Dr. Voelcker's exhaustive paper on Dung.

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* Page 202.

SHEEP GRAZING ON PASTURE.

A very laudable attempt was made to test the effect on grass from fifty sheep grazing with a pound of cake each per day, and fifty sheep grazing without cake. The experiment had no reference to the effect on the sheep; only to the effect on the pasture. Mr. Jamieson truly states no doubt that the small increase in the sheep was due to the unnatural conditions under which they were fed. I have experienced the same difficulty.

Mr. Jamieson then goes at much length into elaborate calculations as to the effect on the soil (postponing the effect on the sheep). The calculations refer to carbonaceous food (starch in grass, sugar in turnips), and the quantities of nitrogen, phosphorus, and potassium. They speak of what comes from the air, and of what comes from the soil; of what is returned to or dispersed in the air by respiration, and of what is returned to the soil in manure. Most interesting and most difficult questions are these. But Mr. Jamieson, as I understand him, is not in this part of his Report detailing scientific experiments of his own; rather reasoning on the common stock of knowledge relating to organic chemistry.

Having in another paper done the best in my power to assist my junior friends on such questions by referring to acknowledged authorities, I will make no comment on this part of the Report, but only add, that the Report contains a most elaborate diagram, which must have cost a vast amount of labour.

The diagram is intended to show the effect on grass by mowing and by grazing on different systems.

	1st Year.	Crop.
1. *Not* manured	Mown	2500
2. Manured	Mown	5000
3. Manured	Mown	5000
4. *Not* manured	Grazed, no artificial food	2500
5. Manured	Grazed, no artificial food	5000
6. *Not* manured	Grazed, no artificial food	2500
7. Manured	Grazed, artificial food	5000

1. The two systems most profitable to the farmer and the grazier are also the systems best for the soil. No. 7, where the soil is suitably manured, grazed, and artificial food given, and No. 5, by which the soil is manured, crop is grazed, and no artificial food is given.

2. The two systems worst for the farmer are No. 6, where no manure is given, the pasture being grazed with cake, in which case the land is slightly enriched; and another, No. 4, where no manure is given and crop grazed without cake.

3. That the soil has neither profit nor loss by system No. 3,

which might be termed the system of fair and rational manuring, whereby an amount of manure is given, exactly equivalent in essentials to that contained in the crop taken off, and the farmer simply uses the soil without using it up.

4. That the system No. 1, giving no manure and mowing, and another, No. 2, giving insufficient manure and mowing, are the most severe on the land, do not stand high in regard to paying, and must gradually become less and less remunerative.

I have endeavoured to gather from the Report a fair statement of its aims and methods. I think it errs by attempting to give an appearance of pure scientific experiments and original research, without the conditions necessary for the discovery of principles of chemistry and vegetable and animal physiology. Beds of 4 or 5 feet square in a sand pit are not precise enough for laboratory work, especially when not close at hand to the investigator. On the other hand, plots in a field on a scale of 112 to the acre do not suffice to yield average agricultural samples. So at least it seems to me, after many attempts both on the small and the large scale.

Still I have felt and still feel grateful to the Sussex Association and to Mr. Jamieson for the interest which they have helped to awaken in agricultural experiments.

I will venture to end with a quotation from the conclusion of the Sussex Report, taking the liberty to alter two or three words in order to express what I have often felt myself as to the difficulty of attempting to find out the meaning of current and traditional practice, and if possible to improve upon it.

"It almost seems even now, as it might be truly said, that in carrying out the various systems of cultivation" [*read*, "various experiments and speculations"], "we in most cases do not know what we want to do. . . . Hence many of our efforts may be wide of the mark."

T. D. Acland.

6.—*Proceedings of the Agricultural Research Associations, North-Eastern Country of Scotland.*

Since the notice of the Sussex Report has been in print, the Agricultural Research Report has come to hand.

It is certainly a remarkable fact that the Report reaches over 5000 persons—landowners, tenantry, and farmers' clubs.

We learn with regret that the farm of which there was an account in the last Journal has been given up. The doctrines of "rest," the "necessity for dung," or for "rotation of crops," have been tested for five years, and so far as those years of practical experience can show, they are said to be negatived.

The doctrine of rest is no doubt firmly held by some; but will probably give way; so also may the need for special rotations. As to dung, that is treated elsewhere in this Journal.

The farm appears to have taught its conductor some lessons not new to the practical farmer—as the need for active supervision of details, the difficulties of organising labour, and other subjects, without a mastery of which the application of science to practice can make little progress.

One point of much interest is insisted on—the connection between thrift and successful farming.

Experiments on individual grasses have been carried on as before in the North, and also in Sussex.

As has been said before in this Journal, if inexperienced young farmers would sow in a garden a pinch of pure seed of all the best grasses, and study their earliness, time of flowering and seeding, their permanence, or their extinction, and if they would dig up a sod or two of turf from rich and poor pastures, and make themselves thoroughly acquainted with the produce, they would learn a good deal; but to call such records of fact in a particular case science and research, is hardly to measure words by their meaning.

It must be remembered that the behaviour of all the grasses and their nutritive qualities have been carefully studied with the aid of chemical analysis by competent and highly-trained observers. Some may have trade interests, but they are not all ignorant men.

It must also be borne in mind that grasses do not grow singly in pastures, nor would it be expedient in general to grow crops of one sort of grass, early or late, for cattle-food.

The Report goes back to the old question of the most economical and most profitable mode of applying phosphates, whether mechanical or chemical. It does not seem that any special new light is thrown on a question which has been discussed thoroughly. Some remarks are made on the subject of slag-phosphates, on which fuller information is no doubt desirable.

Eleven subjects are still said to be under investigation. But many of the subjects are already understood by all who are [illegible]quainted with standard works on Botany, and Chemistry, and [illegible]siology.

[illegible] will hardly, to take one example, be admitted by any one [illegible] studied such books as those of the late Professor Asa [illegible] the United States, noticed in our last Journal, or the [illegible] Text-book of Botany by Sachs (published at Oxford), or [illegible] Elementary Text-book of Prantl, both translated and edited [illegible] Mr Sydney Vines, Lecturer at Cambridge, that investiga-

tions, claiming to be original, are now needed to discover "what mineral ingredients are essential to plants," or whether "different families differ in these essentials."

It may, however, be suggested that the practical farmer needs to be warned against premature conclusions from statements as to the constituent elements of plants and foods and soils, assumed to be the result of agricultural research.

Great chemists, such as Liebig, though discoverers of important abstract truths, have made mistakes in their practical conclusions.

Those who have taken most pains to turn to account the marvellous industry of highly qualified scientific investigators, will probably agree as to what is now most to be desired. We need the intelligent co-operation of educated and experienced observers, in the endeavour to apply established scientific principles to practice. We need also the careful record of facts collected under different circumstances on an adequate scale, with a view to the further interpretation and possible correction of experience.

So far as the Scotch Agricultural Research Association tends to awaken more generally a spirit of earnest enquiry into the laws of nature, and a desire for an accurate knowledge of facts, it must have the best wishes of all who are interested in the prosperity of our great national industry.

T. D. A.

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7. *Ensilage.* A Lecture delivered to the members of the Kendal Farmers' Club, Dec. 1st, 1888, by Dr. J. Augustus Voelcker. Kendal: W. Birkett.

The subject of Ensilage has been so frequently and fully discussed by the many able men who have spoken and written upon it, that it might almost be supposed by this time to be thoroughly thrashed out. The Lecture, however, which Dr. J. Augustus Voelcker has recently delivered, to the members of the Kendal Farmers' Club, treats the subject with so much freshness, clearness, and scientific candour, that it cannot fail to enlarge the circle of intelligent enquirers, and induce many, whose creed is ensilage, to 'season their admiration for a while,' till the truth now partially known is more completely understood.

"I am convinced," says the Lecturer, "that even among those who have adopted ensilage, and those who have experienced its advantages, the more reasonable will be found in accord in asserting its true value to consist, not in the exclusion of other systems, or in the alteration of the approved methods

of practical experience, but in its being a useful adjunct to them under special circumstances of locality, climate, and season."

As to the distinction between sweet and sour silage, Dr. Voelcker says:—

"I have paid a good deal of attention to the matter of 'sour' and 'sweet' silage, and my experience is that when people speak of their making 'sour' or 'sweet' silage, and advocate the claims of one or the other, they do not as a rule know sufficiently what they are speaking of. For, in examining a silo or stack, I have frequently found all manner of variations throughout it, it being sweet in one part and slightly sour in another, and exceedingly sour in another—and all in the same silo or stack. Indeed, I do not think it well to place too much importance upon the matter of sour or sweet; this must be made altogether subservient to the general circumstances of the case, and to the convenience of the farmer. Silage that is really sweet is undoubtedly very nice, but I would not think of making it at the risk of impeding other operations or wasting time. . . . Extremely sour silage is not, I think, desirable, nor yet is that which is black and burnt, as the result of the temperature going too high, and which has a smell something like tobacco. This I have found to have a scouring effect on cattle."

With one more extract our notice must conclude:—

"The making of grass into silage . . . shows some deterioration, though by no means a large one, in feeding constituents, as compared with hay, whilst retaining the succulent nature which distinguishes it from the latter. It is clear that, in comparison with the original grass, silage cannot be expected to gain in value, and that there must be loss rather than gain; for ensiling can not put in any material food constituents not present in the original crop from which the silage is made. Whether or no the indigestible matter is rendered more digestible by the process, is still a matter of dispute. Though analysis would not seem to show much alterations in quantity, it is quite possible that the subjection to a continuous heating when in a moist state, may induce a better mechanical condition in hard fibrous material, which may make it more palatable to stock."

The final words of the Doctor are in deprecation of a *wholesale* alteration of the good practice and present system of farming, and in this advice we heartily concur.

3.—*The Principles of Agricultural Practice as an Instructional Subject.* By JOHN WRIGHTSON, M.R.A.C., F.C.S., &c., Examiner in Agriculture to the Science and Art Department, &c. London: Chapman and Hall.

If this book were called "The Practice of Agricultural Principles" instead of "The Principles of Agricultural Practice," the title would not be absolutely exact, but it would be somewhat more descriptive of it. Of the principles of Agriculture it contains much, but of the practice of Agriculture it contains considerably more. The latter, too, is on the whole the more

valuable part. The larger proportion of it consists of what might be termed "hints"—many of them extremely useful hints—" to the clay-land farmer." As a compendious presentation of the principles of Agriculture it is to some extent disappointing and unequal. On the one hand, vast subjects, such as dairying and stock-keeping, are dismissed with a few brief sentences; and on the other, one or two subjects, such as the influence of geology on soil-formation and the best mode of cultivating heavy land, are dealt with in almost diffuse detail. A perusal of the work, therefore, leaves a somewhat one-sided impression of British agriculture. On the two special points mentioned the book is highly valuable; the chapters devoted to geology and to the formation of soils being admirable. So, too, with the chapters on cultivation and the rotation of crops. They are, on the whole, thoroughly practical, and would afford useful suggestions to occupiers of heavy land, and indeed to arable farmers generally.

The style of the book is not free from faults, but these are to some extent attributable to the conditions of its production. Professor Wrightson, in a preface, asks the reader's indulgence for the method of treatment, and for "a certain amount of summary and repetition." As the work consists of a series of lectures delivered to science teachers, the chapters contain a certain amount of professorial recapitulation, which in lectures, perhaps, might be considered traditionally appropriate, but in a treatise ought to be dispensed with. To the same fact are doubtless due occasional discursiveness and iteration, which, though distasteful to the reader, would probably be useful to the hearer.

The book comprises 213 octavo pages, and is divided into fourteen chapters. The first chapter, which is an introduction to the subject, forms a suggestive epitome, and, so far as it goes, fairly covers the ground, but it introduces very much more than the succeeding chapters attempt to deal with. Mention, for instance, is made of the art of dairying, the processes of fattening and dieting stock, the designing of farm buildings, the economical use of horse power, the relation of chemistry and other sciences to agriculture. But not one of these important questions is dealt with subsequently to any adequate degree. Probably they are reserved for a future volume, which may be considered as a proximate event. With this remark in passing, let us proceed to examine briefly the subjects which are referred to at length. In the first place, prominence is very properly given to the origin of soils. This, as has been said, is ably dealt with. Professor Wrightson quotes a pregnant epigram made by the late John Chalmers Morton about the

soil: "It is a storehouse; it is a laboratory; and it is a vehicle." This extremely pithy saying is well amplified by our author. He says:—

"It is a storehouse of plant food. It is the grazing-ground for plants. It is a physiological and chemical laboratory, in which changes take place of all kinds—changes in the inorganic materials; changes in the organic matter, assisted by countless myriads of bacteria, causing a kind of fermentation which results in what is called nitrification—actions and re-actions going on. The conclusion is, that we have in the soil the very womb of all life. It is the nursing mother of us all, and the more we study its wonderful and complicated structure, and the cosmic forces which act upon it and develop its powers, the more will we be struck with the immediate and strong ties which attach all animated nature to our mother earth. This is where all life is elaborated, assisted, or acted upon, of course, by other external forces which must not be forgotten—moisture and a suitable temperature. There must be moisture; there must be suitable temperature; and these, brought to bear upon the wonderful properties of the soil, cause the germination of the seed and the growth of the plant."

Professor Wrightson suggests the following classification of soils, which is indeed that commonly adopted:—

"(1) Clays; (2) clay loams, that is, loams which abound in the argillaceous element; (3) loams, which are easy working and friable garden soils; (4) sandy loams, or soils which are still loamy, but in which sand predominates; and (5) sands. Clay stands at one end of the series: then clay loams; loams in the centre; then sandy loams; and sand, forming a series which will enable us to describe very extensive classes of soil."

The author next proceeds to point out the distinction between conditions and indications of fertility. The former he defines as six in number, viz. abundance of plant food in an available state, depth of soil, absence of injurious substances, good texture of soil, suitable subsoil, and climate. Indications of fertility are divided briefly into those which are "evident to the senses," such as "the contour of the landscape, the character of the trees and of vegetable growth of all descriptions, as well as the colour, depth, and other peculiarities of the soil," and those which are not evident to the senses, such as "the composition of the soil as arrived at in the laboratory," and the geological position. With reference to crops, it is remarked that they "are not a very good indication of the fertility of land. As a general truth, good land will bear good crops; but good land sometimes bears bad crops, when it is badly farmed; and bad land very often bears good crops, but it is done at great expense."

It would be of interest to the readers of the 'Journal' to quote at length from the chapters devoted to the geological presentation of agricultural conditions. One extract, referring to the Old Red Sandstone formation, may be taken as an illustration of the interesting and practical manner in which this part of the subject is treated:—

"The Old Red Sandstone, as might be expected, is to be found upon the far west and north; for instance, it first comes to the surface on the north bank of the river Severn, forming a portion of Monmouthshire, Herefordshire, and a small part of Worcestershire. It crosses to Brecknockshire, and very generally gives soils of extraordinarily high fertility. Like many other formations, it is divided by geologists into upper, middle, and lower. We may dismiss the upper and lower as giving districts in which the soils are remarkably poor, as, for instance, in Sutherlandshire and in part of Gloucestershire. But the middle members, or the cornstones and the marls, give soil of high fertility, so that the Old Red Sandstone is spoken of as highly fertile. This is so in the county of Monmouth and in Herefordshire, where there is splendid land, adapted for the growth of hops, fruit, and well adapted for wheat. In the counties of Hereford, Worcestershire, and Monmouthshire, are very rich, red soils, and in South Devon also, in the neighbourhood of Torquay, there are very rich soils, and in Cornwall, where there are many districts in which the earliest peas, new potatoes, and vegetables for the London market are reared—all upon the Old Red Sandstone. We meet with them in Cornwall, Devonshire, Monmouth, Herefordshire, Worcestershire, and Brecknockshire; and then again the Old Red Sandstone crops out in Berwickshire to a certain limited extent, but more extensively in Lothian, where it forms the basis of the celebrated East Lothian farming, extending right away down from the Firth of Clyde to Forth, and to Dunbar.

"The fertility of the Old Red Sandstone is very high in this part of the United Kingdom, the rents having been to my own knowledge as much as 5*l.* per acre over large areas. I have seen five hundred acres of land lying on the Old Red Sandstone let at 2500*l.* a year; but rents have come down a good deal in late years, though, perhaps, not so much as some of us would at first sight imagine. The Old Red Sandstone occupies a position on the east of Scotland—in Caithness, in Cromartie, round the Moray Firth, and it has been pointed out as an extraordinary fact that wheat cultivation can be carried on upon the soils of the Old Red Sandstone further north than on any other formation."

The relation of geology to agriculture is thus summed up by Professor Wrightson :—

"All soils, from whatever geological formation derived, have certain points in common. They all are composed upon the general principle or general arrangement of proximate constituents already named. All contain a certain variable proportion of soluble plant food. All are made up of the four or five familiar substances—sand, clay, lime, and vegetable matter, interspersed with mineral fragments. And again, upon every formation good land and bad land, and in very many cases light land and heavy land, are to be found.

"But, while this is the case, it is equally true that there is a leading character which runs through soils derived from the principal formations, either as regards the general contour of the districts, and consequently of the soils resting upon it, or it may be the fertility or non-fertility of these soils. Certain geological formations may be spoken of as usually characterised by the presence of heavy land; for example, the London, the Weald, the Gault, the Kimmeridge, the Oxford, and the Lias clays. All these yield soils of stiff character. On the other hand, in certain formations light, easy-working soils predominate, more suitable for sheep-farming in combination with arable cultivation; as, for example, the soils of the Upper Chalk, of the Lower Oolite, of the Magnesian Limestone, and of the Yoredale rocks and the Millstone Grit. Again, we have formations which have earned the reputation of producing rich soils, and among these may be particularly mentioned alluvial or diluvial soils of mixed origin which accompany the course of rivers, and are especially

to be seen around their estuaries, and also forming soils near the coast by the action of tidal currents and tidal deposits. These soils are also of mixed origin, and are therefore sure to be fertile.

"Rich soils are frequently to be found where two or more formations meet together, and where the soils are mingled—around the edges of formations. Rich classes of soils are derived from the decay of the Lower Chalk, the Upper Greensand, the Corn-brash, the Lower Oolite, the Lias Clay, the marls of the New Red Sandstone, the cornstones and marls of the Old Red Sandstone, and the decay of basaltic, trappean, and lava rock. Other formations, again, yield soils of low average fertility, among which may be mentioned the soils of the Upper Chalk, of the Lower Greensand, of the Oxford Clay, of the Magnesian and Mountain Limestone, of granite rocks, and of those lower primary stratifications which have been spoken of as the Silurian, Cambrian, and the Laurentian, which frequently rise up into very high mountains. The geological derivation of soils is therefore one of the indications by which we may assist ourselves to come to a conclusion with reference to the quality of soils."

On the subject of cultivation our author is, as already mentioned, very practical, and so far as his suggestions go they may well be studied; but he is, perhaps, somewhat unnecessarily emphatic in one chapter in his condemnation of "new-fangled ideas" in agriculture. British farming has not yet suffered very greatly from an overweening alacrity in the adoption of improvements. No doubt, as he says, "it is the most difficult thing in the world to introduce new methods into an old business." But it is certain that the old business has to contend with conditions which have been virtually revolutionised during the past ten years, and surely there is, in that circumstance, some justification for the suggestion of new methods. Curiously enough, in a later chapter, Professor Wrightson refers to the comparatively recent introduction of most of the crops now cultivated:—

"Their introduction," he says, "forms a very instructive page of history, and must always be an excellent illustration of the value of observation and science. The history of cultivated plants, as well as the history of the improvement of animals, are grand chapters in the national progress, and it is well to impress them upon young people, as it may lead them to endeavour to add to the stock of knowledge already handed down."

The question of manuring is dealt with at some length, but it practically resolves itself into a simple formula—farmyard-manure, and plenty of it: this is the gist of Professor Wrightson's advice. He will not hear of its costliness; in fact, he says (p. 153), "it ought to be produced for nothing"; that, in other words, it is a "bye-product" of agriculture. Nor do the Rothamsted experiments shake his faith, "because there is a very great difference between consecutive corn growing, coupled with consecutive dunging of the ground, and the ordinary system of farming by rotation of crops." Nevertheless, though in reference to the favoured dung Rothamsted is not to

be relied upon, he proceeds subsequently to base all his statements respecting the effects of artificial dressings on the experiments of Lawes and Gilbert.

Professor Wrightson digresses a little to give his views as to the proper mode of conducting agricultural experiments. As he does not differ in any respect from the chief authorities on the subject, it is unnecessary to follow him. He dwells on the point that land for experimental purposes should be in low condition—which is indeed a mere truism. He remarks that "it does not astonish old experimenters at all when they get a *minus* result"—that is, less than on the unmanured plots—"after the application of thoroughly credited, well-established fertilizers." No doubt on land in comparatively high condition this may frequently occur, but it is doubtful if all "old experimenters" will consider it to be quite so much a matter of course as Professor Wrightson takes it to be.

On the subject of the introduction of basic cinder—which up to the present time has been regarded with far less favour in England than in Germany, where there appears to be a great demand for it—Professor Wrightson gives some very interesting information :—

"The most notable addition to our sources of phosphoric acid of late years is undoubtedly basic cinder. Basic cinder, or Thomas phosphate powder, is destined to play a very important part as a fertilizer. I have a pamphlet before me in which I am told that no less than 200,000 tons of this cinder are produced in the iron works of Germany, and 130,000 tons are produced in England. It is a bye-product in the system of making Bessemer steel. It is basic in character, being formed from dolomite. . . . . The most extraordinary thing with reference to basic cinder is that it is most beneficial when applied in the simplest possible form, namely, simply disintegrated. My attention was invited to this subject four years ago, and, in conjunction with Dr. Munro, I conducted experiments at that time on the invitation of the North-Eastern Steel Company, both at Downton and in the county of Durham.

"We were unfortunate in 1884: first in selecting mangel wurzel for the purpose of the experiment, a plant less responsive to dressing of phosphatic material than the turnip or swede; and secondly, we were driven to try this experiment on land in a high state of fertility from previous management. The consequence was, our results were, so to speak, negative or neutral, and they did not succeed in showing any great effect from the use of basic cinder. But in the following year we undertook a double series of experiments, partly on Downton College Farm, and partly in the county of Durham, on the farm of the Carlton Iron Works Company, and there we got most definite results, which are embodied in the report published by the North-Eastern Steel Company. These experiments established in this country the effect of basic cinder. Other experiments seem to have been going on during the same season in Germany, and both in Germany and this country the effect of basic cinder as a fertilizer has been thoroughly proved. It is a curious fact that basic cinder should produce as great an effect as superphosphate, which in many cases it does. Undissolved basic cinder produced pretty nearly as

much effect as superphosphate with ammonia salts, and a much better result than ground coprolites.

"The peculiarity of the basic cinder appears to be that it contains a very large excess of lime in somewhat unstable combination with phosphoric acid. To put the matter briefly, we have in the case of monobasic phosphate one atom of lime in combination with phosphoric acid. In reduced phosphate we have two atoms of lime united with one of phosphoric acid, and in tricalcic phosphate, which is insoluble phosphate, we have three atoms of lime. But at the high temperature at which the basic cinder is formed, we get four parts of lime united with the phosphoric acid. We have a higher proportion of base, and a tetralcic phosphate produced; but, although it is true within limits that the larger proportion of lime the less soluble is the phosphate, yet the excessive quantity of lime appears to introduce an element of instability into the compound. It readily breaks down, and this appears to be the reason why the basic cinder is more efficacious as a manure than tricalcic phosphate, or even than reduced phosphates."

In concluding a notice which we would willingly extend by further quotations, did space permit, we may take an extract from the chapter on Rotation of Crops:—

"The fallowing of land was definitely introduced into this country by the Romans, and it was introduced from this country into Scotland much later. Even in the earlier years of the last century the systematic working of fallows was unknown in Scotland. The most ancient rotation which I know of is that which once obtained over the whole of Europe, and which is stated by a very competent authority, De Morier, to date back to, at all events, as early as the first century of the Christian era. It is the old Teutonic three-field course, well known in German practice by the ancient village communities of the German Empire, and practised to this very day. It consists, in the first place, of a period of bare fallow, with tilth and tillage of the land, followed always by winter corn, and that again followed by summer corn; fallow, wheat, oats, or it might be fallow, wheat, beans, or the two might be taken alternately, in which case it would assume the form of fallow, wheat, beans, fallow, wheat, oats. This is the old three-field course which Prof. Rogers, in his 'History of Agriculture and Prices,' states was prevalent over the whole of England in the eleventh century, and it exists in practice in some of our later and less advanced counties at the present time."

We have endeavoured to deal candidly with a work which in some respects invites criticism, but as a whole may be cordially commended to the consideration of farmers. It is in a handy form, and next, perhaps, to Professor Fream's "Rothamsted Experiments," there is no work of the past year which has better claims to be added to the farmer's library. Without desiring to be hypercritical, we cannot refrain from pointing out what is presumably a misprint on p. 112. Reference is there made to Philip *Pewsey* as one of the greatest of agriculturists who ever lived. This description is accurately applicable, and was probably intended to apply, to Philip Pusey. No name in agricultural literature deserves more respect than his, and precision with regard to it is therefore a duty.

9.—*The Rothamsted Experiments on the Growth of Wheat, Barley, and the Mixed Herbage of Grass Land.* By WILLIAM FREAM, B.Sc. Lond., F.L.S., F.G.S.. F.S.S. London: Horace Cox, *Field* Office, 346, Strand, W.C.

THIS book supplies a long-felt want. The researches and results of Rothamsted are a mine—indeed we may almost say *the* mine—of agricultural knowledge. The continuous and patient investigations of Sir John Lawes and Dr. Gilbert form the basis of modern farming. For nearly half a century they have laboriously and conscientiously studied questions of the deepest import and most direct interest to British agriculture. They have worked for the public good, and as they have established facts, they have given them with a free hand to the world. But the very liberality of the benevolent master of Rothamsted has partially created a difficulty. Had he worked for gain, the results of his labours—intrinsically invaluable—would, so to speak, have been a standard commodity in the book market. They would have been sold over the publisher's counter at their market price. But Sir John Lawes has gratuitously strewn before the public, time after time, the results of his experiments and investigations. They have been communicated to the Royal Agricultural Society, to the British Association, to the Royal Society, to the Statistical Society, to the Chemical Society, to the Linnæan Society, or to some other learned body. Or they are to be found in the *Archives des Sciences physiques et naturelles*, in the 'Philosophical Magazine,' in the 'Journal of Anatomy and Physiology,' or in the 'Edinburgh Veterinary Review.' Here and there throughout the literature of science the record of Rothamsted is to be found, but of a connected and compendious account of the work done there is none. It is with the laudable aim of making at least some portion of the practical agricultural labours of Lawes and Gilbert available to the ordinary farm student that Dr. Fream has written the book now under review. He acknowledges the characteristically kind and ready manner in which Sir John Lawes and Dr. Gilbert have countenanced and assisted his undertaking. The volume is dedicated to them, and opens with a fitting tribute to "the long-continued and successful investigations in every domain of agricultural enquiry" which have "made the name of the Rothamsted experimental station famous throughout the world."

The book consists of 225 pages, and, of course, deals with one branch only of the work done at Rothamsted. The avowed object of the author was to present in a succinct and collected form a description of the Rothamsted experiments on wheat,

barley, and grass. This he has very clearly and ably done. Dr. Fream shows a sympathetic insight into the labours which he describes, and a firm grasp of the complicated calculations in which they are largely embodied. In a forcible and straightforward style he picks out the pith of the matter and places it before his readers, with no superfluous comment, but with a considerable amount of tact and judgment. To give anything like an intelligible account of the book—beyond a bald list of contents — is difficult. As it is itself a highly condensed summary, it is not easy to summarise it.

The three subjects of wheat, barley, and grass are taken in the order named, but nearly half the space is devoted to the grass experiments. After describing the experiments on wheat at Holkham and Rodmersham—which were conducted under the direction and on the lines of Rothamsted—the author describes the scope, details, and results of the continuous growth of wheat for forty years. Most people know something of the remarkable lessons which these experiments have taught. The most striking, perhaps, are those obtained from the continuously unmanured plots. Dr. Fream thus sums up these results:—

"It appears, then, that upon a field which has been under arable cultivation certainly for two or three centuries, and possibly for a much longer period, and which has consequently lost a very considerable amount of its original fertility, there is—after the removal of forty unmanured crops—a yield which differs very little from the average of some of the great wheat-growing countries of the world; the yield of the United States, India, and China being, it is stated, from 12 to 13 bushels per acre. As the Rothamsted soil certainly contains a very much less stock of fertility than the soils upon which wheat is extensively grown in other countries, it is impossible to attribute the comparatively large yields there to any other cause than to the clean state of the land. The amount of food at the disposal of the crop is small, but it is not shared to any great extent with other plants. The large produce of both wheat and barley on the unmanured land in the Woburn experiments also shows how much the crops grown upon the ordinary cultivated land of this country are reduced by weeds. It is true that weeds do not exhaust a soil, as in their decay the fertility which they have taken up becomes again available; but they take up nitrates, which, during their growth, revert to the form of organic nitrogen (that is, nitrogen combined with carbon), and this must undergo nitrification in the soil before becoming again available as plant food. Considering the high price paid for active nitrogen, as in salts of ammonia or nitrate of soda, a serious loss is incurred if this nitrogen goes to promote the growth of weeds, as so much time must elapse before it is again available as food for a future crop."

It is estimated that the average decline in the produce of the continuously unmanured wheat plots, due to exhaustion, and irrespective of variations due to good or bad seasons, is about a quarter of a bushel per acre per annum. The mean produce of grain during the forty years is 14 bushels per acre; but during the first decade there was an average of 15¾ bushels, and during

the last decade of 10¼ bushels. Taking these figures, therefore, the average annual decline was little more than one-eighth of a bushel per acre. The history of the various manured plots, and the precise effects of the different kinds, are carefully and concisely epitomised. It is calculated that 5 lb. of ammonia per acre will obtain an increase of 1 bushel of wheat grain, and its proportion of straw. The conclusions as to manures are thus stated :—

"Minerals alone have added very slightly to the unmanured produce, whereas manures containing nitric acid alone, or some easily nitrifiable compound of nitrogen, have considerably increased the crop; hence the soil had a stock of minerals which the crop was unable to utilise, on account of the insufficient supply of available nitrogen. Manures consisting of potash, phosphoric acid, and nitrogen (as ammonia-salts or as nitrates), appear competent to grow large crops of wheat continuously. In the ordinary course of agriculture with rotation, as practised in this country, the supply of mineral constituents immediately available for the wheat crop is almost invariably in excess, relatively, to the immediately available supply of nitrogen from the atmosphere, or the accumulated stores within the soil itself. Furthermore, with few exceptions, the worse the so-called 'condition' of the land—that is, the more it is in the agricultural sense exhausted—the more striking would be the effect of exclusively nitrogenous as compared with that of exclusively mineral manures. A given weight of nitrogen, as nitric acid (or nitrate) has produced more growth than the same weight of nitrogen as ammonia-salts. The amount of nitrogen supplied in the manures is very much in excess of the amount recovered in the increase of the crops; and, after a certain amount of growth has been reached, each increase of crop requires a proportionately larger application of manure. When the price of wheat is high, larger crops can be grown more profitably than when the price is low. In the form of farmyard-manure, a considerably larger amount of nitrogen is necessary to produce a given increase of crop; but, though a given weight of nitrogen, in the form of nitric acid, will produce more growth than the same weight of nitrogen in dung, the influence of the nitrate upon succeeding crops will be very much less. There is no evidence to show whether the whole available effect of the nitrogen in one manure is greater than it is in the other."

One of the most interesting chapters is that devoted to the "influence of climate on the cultivation of wheat." It is remarked that, so far as climate is concerned, the British Isles are outside the zone favourable to the growth of wheat. The seasons, however—in spite of recent experience—do not get worse for wheat-growing. On the contrary, by dividing the 108 years ending with 1880 into six periods of eighteen years each, it is found that there is a slight progressive increase of mean temperature from the first to the last of those periods. The effects of the different seasons during the time of the Rothamsted experiments are clearly noted. It is proved that the popular belief in the weather as the main factor in producing good or bad crops is perfectly accurate. Dr. Fream observes :—

"As only about 5 per cent. of the total wheat crop is derived from the soil itself, the remainder coming, directly or indirectly, from the atmosphere; and

as the amount of matter accumulated from either source depends mainly on the quantity, and the relations to one another, of heat and moisture, the preponderating influence which the character of the seasons exercises over the growth of our crops is no more than might be expected. Though the connection between meteorological phenomena and the progress of vegetation is not yet so clearly comprehended as to enable us to estimate with any accuracy the yield of a crop by studying the statistics of the weather during the period of its growth, the present attempt is, nevertheless, a valuable contribution towards such an object."

The question of the desirability of applying manures in the autumn or the spring is concisely referred to. When sown in the form of ammonia-salts, there is always great risk of a loss of nitrogen by reason of its being carried off in the form of nitrates by drainage. In the course of seven years it was found that the crops on which the ammonia-salts were sown in the autumn gave an average yield of 22½ bushels, while those on which it was sown in the spring averaged 27¾ bushels. The section on Wheat concludes with a summary of the researches of Sir John Lawes and Dr. Gilbert into the home produce, imports, and consumption of wheat. The Rothamsted investigations adopt a standard of 28 bushels per acre as the normal average yield of wheat in the United Kingdom, although a series of bad seasons has at present reduced the average for the thirty-two years ending 1883 to 27 bushels. The consumption of wheat per head of the population is a point upon which an enormous amount of pains has been bestowed. The quantity now accepted is 5½ bushels per annum per head of population. A table is given, being the epitome of a much more elaborate one, showing the home produce, imports, and consumption of wheat in the years 1852–87.

A section, to which reference can only be made in passing, is devoted to the experiments on the barley crop, which are on a similar scale to those on wheat. We cannot refrain, however, from quoting the following practical conclusion of the whole matter :—

"It may be laid down as a general rule, applicable to the country at large, that, on the heavier soils, full crops of barley of good quality may be grown with great certainty after a preceding corn crop, under the following conditions: The land should be got into good tilth. It should be ploughed up when dry, as soon as practicable after the removal of the preceding crop. In the spring it should be prepared for sowing by ploughing or scuffling as early in March as possible, if sufficiently dry. The artificial manure employed should contain nitrogen, as ammonia or nitrate (or organic matter), and phosphates. From 0 lb. to 50 lb. of ammonia (or its equivalent of nitrogen as nitrate), should be applied per acre. These quantities would be supplied in 1¼ cwt. to cwt. of sulphate of ammonia, or 1¾ cwt. to 2¼ cwt. of nitrate of soda. Vith either of these there should be employed 2 cwt. to 3 cwt. mineral superphosphate of lime. Rape cake is also a good manure for barley; from 6 cwt. o ? cwt. would supply about as much nitrogen as would be equal to from

40 lb. to 50 lb. of ammonia. With this manure, as with guano, the addition of superphosphate is unnecessary. Whatever manure be used, it should be broken up, finely sifted, sown broadcast, and harrowed in with the seeds."

As a compendious comment on the wheat and barley experiments, Dr. Fream adds the following brief but useful comparison:—

"Lastly, comparing wheat with barley, it is apparent that the requirements of barley within the soil, and the susceptibility of this cereal to the external influence of season, are very similar to those of its near ally, wheat; but there are distinctions of result, dependent on differences in the habits of the plants, and in the conditions of their cultivation accordingly. Wheat is, as a rule, sown in the autumn, in a heavier and closer soil, and has four or five months in which to distribute its roots and get possession of a wide range of soil and subsoil, before barley is sown. Barley is sown in a lighter surface soil, and, with its short period for root development, relies in a much greater degree on the stores within the surface soil. Hence it is more susceptible to exhaustion of surface soil as to its nitrogenous, and especially as to its mineral supplies; and in the common practice of agriculture it is found to be more benefited by direct mineral manures, especially phosphatic manures, than is wheat when sown under equivalent soil conditions. The exhaustion induced by both crops is, however, characteristically that of available nitrogen; and when, under the ordinary conditions of manuring and cropping, artificial manuring is still required, nitrogenous manures are, as a rule, requisite for both crops; and for the spring-sown one, barley, superphosphate also."

Nearly one hundred pages of the book are occupied by an account of the agricultural results of experiments on the mixed herbage of permanent meadow. There is nothing, perhaps, which remains more vividly in the recollection of the visitor to Rothamsted than the experimental panorama, so to speak, presented by the seven acres set apart in a corner of the Park to cultivation under varying conditions of permanent pasture. The grass has been laid down from time immemorial; indeed, so far as is known, it is primeval pasture. Yet in the course of little more than thirty years the various adjoining plots, by mere manuring, have come to present divergences as wide as if they were in different climates. The broad lesson to the farmer is so distinct, that he who runs may read. The lesson is that his pasture is what he chooses to make it. The details and distinctions are plainly set forth by Professor Fream, but it is impossible even to epitomise them intelligibly in the space here available. Suffice it to say that they are stated with admirable lucidity, and that a study of them in this concise form may be confidently recommended to every occupier of grass land. This recommendation indeed applies to the whole book and to all classes of agriculturists. It is one which, to use a hackneyed phrase in its most emphatic sense, no farmer's library should be without.

Bath and West of England Society
(ESTABLISHED 1777,)
AND
Southern Counties Association,
FOR THE
Encouragement of Agriculture, Arts, Manufactures, and Commerce.

GENERAL LAWS.

"I. The Society shall consist of a President, Vice-Presidents, Council, Treasurer, Secretary, Governors, and Members, and shall have the following objects:—

> "1st. To hold meetings in the West and South of England for the exhibition of breeding stock, agricultural implements, and such other articles connected with agriculture, arts, manufactures, or commerce, as may be determined upon by the Council.
>
> "2nd. To offer premiums for essays and reports on subjects affecting agriculture, and to publish a Journal for circulation.

"II. The West of England shall be divided into two districts, to be called the Eastern and Western, and the boundary line separating Devon from Somerset and Dorset shall be the division of such districts; and the following counties, viz., Hants, Berks, Oxford, Surrey, Sussex, and Kent, shall form a third district, to be called the Southern.

"III. The Council shall consist of a president, vice-presidents, and sixty-six other members (thirty-three of whom shall retire annually by rotation, but shall be eligible for re-election), and shall be elected by the whole body of members. Eighteen members of the Council shall be chosen from persons residing or representing property in the Eastern District, eighteen from persons residing or representing property in the Western District, eighteen from persons residing or representing property in the Southern District, and the remaining twelve may be elected from the general body of members, without reference to districts.

"IV. The election of President and Council shall take place at the annual meeting; and they shall enter into office at the conclusion of the annual meeting at which they have been chosen. The Council shall have power to nominate Vice-Presidents, and fill up such vacancies as are left after the annual meeting and in their own body as may from time to time occur during the interval between the annual meetings.

"V. The entire management of the Society, including the power of making bye-laws, of settling the prizes to be awarded, of nominating the committees, fixing the places of meetings, of appointing or removing the Treasurer, Secretary, and such other officers as may be required to carry on the business of this Society, shall be vested in the Council, who shall report their proceedings at the annual meeting.

"VI. The meetings for exhibitions shall be held in different towns in successive years.

"VII. A subscriber of 1*l.* and upwards annually shall be a member entitled to all the privileges of the Society; of 2*l.*, a governor, and eligible for election as a vice-president; and a tenant-farmer, the rateable value of whose holding does not exceed 200*l.* a year, shall by subscribing 10*s.* and upwards annually also be a member of the Society without the privilege of exhibiting at reduced fees (see Law IX.). Each member shall be liable to pay his subscription, until he shall have given notice in writing to the Secretary of his intention to withdraw. The subscriptions to become due and be paid in advance on the 1st of January in each year. All firms of two or more persons shall subscribe not less than 1*l.* annually.

"VIII. The payment of 10*l.* in one sum shall constitute a member for life, and of 20*l.* in one sum a governor for life; but any member who has subscribed not less than 1*l.* annually for a period of twenty years and upwards may become a life member on the further payment of 5*l.* in one sum; and any governor who has subscribed not less than 2*l.* annually for the same period may become a life governor on the further payment of 10*l.* in one sum.

"IX. To entitle a member to exhibit, he must have been a member for three months, and have paid his subscription, of not less than 1*l.* for the current year, at least one month previous to the closing of the entries. Members subscribing less than 1*l.* and non-members will be permitted to exhibit stock, agricultural implements, or other articles, on payment of such a sum as the Council shall direct.

"X. The Annual Meetings of the Society shall be held in the months of May or June. Special General Meetings may be convened by the President on the written requisition of not less than three members of Council, all members of the Society having fourteen days' notice of the object for which they are called together. At such Annual or Special General Meetings no member of less than three months' standing or whose subscription is in arrear shall be entitled to a vote.

"XI. If it be proved to the satisfaction of the Council that any person has attempted to gain a prize in this or any Agricultural Society by a false Certificate, or by a misrepresentation of any kind, such person shall thereupon be excluded from again exhibiting in this Society.

"XII. All prizes shall be open for competition to the United Kingdom. But no exhibitor of stock, or person intending to compete for any of the Society's prizes, shall be privy to the selection of judges to award the premiums.

"XIII. The proceedings of the Society, including the Prize Reports and List of Members, shall be printed annually, and every subscriber not in arrear with his subscription shall be entitled to receive one copy, free of expense, and there shall be an additional number printed for sale.

"XIV. No new general rule shall be proposed, or existing one altered or rescinded, excepting at an Annual or Special General Meeting, and then only provided a statement in writing shall have been sent to the Secretary at least twenty-one days previously, setting forth the rule to be proposed, rescinded, or altered; and in the last case the proposed alteration shall be stated.

"XV. No subject or question of a political tendency shall ever be introduced at any meeting of this Society."

Bath and West of England Society

(ESTABLISHED 1777,)

AND

Southern Counties Association,

FOR THE

Encouragement of Agriculture, Arts, Manufactures, and Commerce

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List of Officers.

1888–89.

EXETER MEETING.

PATRON.

HIS ROYAL HIGHNESS THE PRINCE OF WALES, K.G.

PRESIDENT FOR 1888–89.

THE RIGHT HON. THE LORD CLINTON.

TRUSTEES.

*ACLAND, THE RIGHT HON. SIR THOMAS DYKE, Bart., Killerton, Exeter.
PAGET, SIR RICHARD HORNER, Bart., M.P., Cranmore Hall, Shepton Mallet.
LENNARD, SIR JOHN FARNABY, Bart., Wickham Court, Beckenham, Kent.

VICE-PRESIDENTS.

*ABERGAVENNY, MARQUESS OF, K.G.	Eridge Castle, Tunbridge Wells
*ACLAND, THE RIGHT HON. SIR T. D., Bart.	Killerton, Exeter
*AMHERST, EARL	Montreal, Sevenoaks, Kent
ASHBURTON, LORD	Alresford, Hants
BARNETT, H.	Glympton Park, Woodstock
*BATH, THE MARQUESS OF	Longleat, Warminster
BELFIELD, JOHN	Primley Hill, Torquay
*BENYON, RICHARD	Englefield House, Reading
BRASSEY, H. A.	Preston Hall, Aylesford.
*BROOKE, THE LORD, M.P.	Easton Lodge, Dunmow
BRUCE, W. A.	96, Sydney Place, Bath
BRYMER, W. E.	Ilsington House, Dorchester
CALTHORPE, LORD	Elvetham Park, Winchfield
*CARLINGFORD, LORD	Chewton Mendip, Somerset
CARNARVON, EARL OF	Highclere Castle, Newbury
CLEVELAND, THE DUKE OF, K.G.	Bathwick, Bath
CORK AND ORRERY, EARL OF	Marston, Frome
CORYTON, COL. A.	Pentillie Castle, Plymouth
*COVENTRY, EARL OF	Croome Court, Severn Stoke, Worcester
DARNLEY, EARL OF	Cobham Hall, Gravesend
DAVIE, SIR H. R. F., Bart.	Creedy Park, Crediton
Da[illegible] R. M.	Glen Croft, St. Leonard's, Exeter

[illegible] whose names an asterisk (*) is prefixed have filled the office of President.

VICE-PRESIDENTS—*continued.*

DEVONSHIRE, THE DUKE OF, K.G.	Chatsworth, Derbyshire
DICKINSON, F. H.	Kingweston, Somerton
DIGBY, G. D. W.	Sherborne Castle, Sherborne
*DUCIE, THE EARL OF	Tortworth, Falfield, R.S.O.
FALMOUTH, VISCOUNT	Tregothnan, Probus, Cornwall
*FORTESCUE, THE EARL	Castle Hill, South Molton
GORE-LANGTON, W. S.	Newton Park, Newton St. Loe
GORING, REV. J.	Wiston Park, Steyning
*HAMPDEN, VISCOUNT	Glynde, near Lewes
HIPPESLEY, J. H.	Stone Easton, Somerset
HULSE, SIR E., Bart.	Breamore, Salisbury
*ILCHESTER, EARL OF	Melbury, Dorchester
*JERSEY, THE EARL OF	Middleton Park, Bicester, Oxon.
KNYFTON, T. TUTTON	Uphill, Weston-super-Mare
*LANSDOWNE, MARQUESS OF	Bowood, Calne
LECONFIELD, LORD	Petworth House, Sussex
LENNARD, SIR J. F., Bart.	Wickham Court, Beckenham, Kent
*LOPES, SIR M., Bart.	Marristow, Roborough, S. Devon
LOVELACE, THE EARL OF	Ashley Combe, Porlock, Somerset
LOYD, LEWIS	Monk's Orchard, Bromley, Kent
MILDMAY, SIR H. ST. JOHN, Bart.	Dogmersfield Park, Winchfield
MOORE-STEVENS, J. C.	Winscott, Great Torrington
MORETON, LORD.	Tortworth, Falfield, R.S.O.
*MORLEY, THE EARL OF	Whiteway, Chudleigh, Devon
MORRELL, G. HERBERT	Headington Hill Hall, Oxford
*MOUNT-EDGCUMBE, EARL OF	Mount-Edgcumbe, Devonport
MOYSEY, HENRY GORGES	Bathealton Court, Wiveliscombe
MURCH, JEROM	Cranwells, Bath
NORTHUMBERLAND, THE DUKE OF	Albany Park, Guildford
PAGET, Sir R.H., Bart., M.P.	Cranmore Hall, Shepton Mallet
PHILLPOTTS, REV. CANON	Porthgwidden, R.S.O., Cornwall
PINNEY, W.	Somerton
POLTIMORE, LORD	Poltimore, Exeter
PORTAL, MELVILLE	Laverstock House, Micheldever, [Hants
PORTMAN, VISCOUNT	Bryanston, Blandford
*PORTSMOUTH, THE EARL OF.	Eggesford House, N. Devon
RICHMOND, THE DUKE OF, K.G.	Goodwood Park, Chichester
SAINT GERMANS, THE EARL OF.	Port Elliot, Devonport
STUCLEY, SIR G. S., Bart.	Moreton, Bideford, N. Devon
SYDNEY, EARL	Frognal, Footscray, Kent
THYNNE, LORD HENRY	Maiden Bradley, Bath
*TREDEGAR, LORD	Tredegar Park, Newport, Monmouth
*TREMAYNE, JOHN	Heligan, St. Austel
TROYTE, COL.	Huntsham Court, Bampton, Devon
WALTER, JOHN	Bearwood, Wokingham
WALROND, SIR J. W., Bart..	Bradfield, Cullompton
WEYMOUTH, LORD, M.P.	Longleat, Warminster
WINCHESTER, THE MARQUESS OF	Amport St. Mary's, Andover

THE LORD WARDEN OF THE STANNARIES.
THE SURVEYOR-GENERAL OF THE DUCHY OF CORNWALL.
THE RECEIVER-GENERAL OF THE DUCHY OF CORNWALL.

*** Those to whose names an asterisk (*) is prefixed have filled the office of President.

MEMBERS OF COUNCIL.

EASTERN DIVISION.

Elected in 1887:—

Name.	*Address.*
Bush, R. H.	The Castle, Chew Magna, Somerset
Dyke, Thomas	Long Ashton Lodge, Clifton
Edwards, C. L. F.	Wrington, R.S.O., Somerset
Gibbs, Antony	Charlton House, Nailsea, Somerset
Jones, Henry Parr	Portway House, Warminster
Luttrell, C.B., Col.	Badgworth Court, Axbridge, R.S.O., Somerset
Sanford, E. A.	Nynehead Court, Wellington

Elected in 1888:—

Name.	*Address.*
Arkwright, J. H.	Hampton Court, Leominster
Danger, Thomas	Rowford Lodge, Taunton
Duckham, T.	Baysham Court, Ross
Hill, J.	Felhampton, Church Stretton
Knollys, J. E.	Fitzhead Court, Taunton
Maule, M. St. J.	Chapel House, Bath
Napier, H. B.	Chippenham
Nevill-Grenville, R.	Butleigh Court, Glastonbury
Williams, E. W.	Herringston, Dorchester

WESTERN DIVISION.

Acland, C. T. D., M.P.	Sprydoncote, Exeter
Calmady, V. P.	Tetcott, Holsworthy
Drewe, Major-Gen. F. E.	The Grange, Honiton
Dymond, Francis W.	Bampfylde House, Exeter
Naper, Col. W. D.	Stanley Lodge, Exmouth
Sanders, E. J.	Stoke House, Exeter
Sillifant, A. O.	Coombe, Copplestone
Trood, Col. R.	Matford, Exeter
Walrond, Col., M.P.	New Court, Topsham, Devon
Boscawen, Hon. and Rev. J. T.	Lamorran, Probus
Collins, C. R.	Strathculm, Hele, Cullompton
Ley, J. H.	Trehill, Exeter
Marker, Richard	Combe, Honiton
Newbery, S. P.	Plympton St. Mary, South Devon
Shelley, Sir J., Bt.	Shobrooke Park, Crediton
Williams, Sir W. R., Bart.	Heanton, Barnstaple
Wippell, Richard	Rudway, Thorverton
Wyatt-Edgell, Arthur	Cowley House, Exeter

SOUTHERN DIVISION.

Ashcroft, W.	Hayes, Beckenham, Kent
Best, Capt. J. C. (R.N.)	Plas-yn-Vivod, Llangollen
Gill, Frederick	Speenhamland, Newbury
Gorringe, Hugh	Kingston-by-Sea, Brighton
Pain, C.	Longstock, Stockbridge, Hants
Parker, James S.	Freelands, Iffley, Oxford
Seymour, R. A. H.	Aylesford, Kent
Sutton, Martin J.	Dyson's Wood, Kidmore, near Reading
Roberts, J. D. Cramer	Highfield, Frant, Tunbridge Wells
Best, Col. G.	Charlton House, Ludwell, Salisbury
Brassey, A.	Heythrop, Chipping Norton, Oxon
Druce, A. F. M.	Fyfield, Abingdon
Grenfell, Arthur	4, Savile Row, London, W.
Simpson, G.	Wray Park, Reigate
Stanford, A.	Eatons, Steyning
Warre, F.	44, Great Ormond Street, Bloomsbury, London
Whitehead, C., F.L.S.	Barming House, Maidstone
Williams, A. G.	Portsea, Hants

ELECTED WITHOUT REFERENCE TO DISTRICT.

Brown, W. J.	Middlehill House, Box Wilts
Chorley, W. L.	Quarme, Dunster
Ford, Henry	Lower House, Branscombe, Sidmouth, Devon
Gibbons, George	Tunley, Bath
Hancock, J. D.	Halse, Taunton
Maskelyne, N. Story, M.P.	Basset Down House, Swindon
Allen, James D.	Belle Vue House, Evercreech
Llewellyn, Evan H., M.P.	Langford Court, Bristol.
Martin, G. E.	Ham Court, Upton-on-Severn
Naylor, Christopher	Kerry, Montgomeryshire
Rolls, John Allan	The Hendre, Monmouth
Skrine, H. D.	Claverton Manor, Bath

EX-OFFICIO MEMBERS.

The Treasurer . . . . . Badcock, Henry Jeffries, Somersetshire Bank, Taunton.

Consulting Surveyor . . Spackman, Henry, 6, Terrace Walk, Bath.

COMMITTEES, 1888-9.

[The PRESIDENT is *ex-officio* Member of all Committees.]

FINANCE.

JONES, H. P., *Chairman.*

COLLINS, C. R.	KNOLLYS, J. E.	MARTIN, G. E.

PUBLICATIONS.

ACLAND, RIGHT HON. SIR THOMAS DYKE, BART., *Chairman.*

ACLAND, C. T. D. (M.P.)	KNOLLYS, J. E. [(C.B.)	MASKELYNE, N. S. (M.P.)
DYMOND, F. W.	LUTTRELL, COL. H. A. F.	

STOCK PRIZE-SHEET.

LUTTRELL, COL. H. A. F. (C.B.), *Chairman.*

BROWN, W. J.	GORRINGE, H.	MOORE-STEVENS, J. C.
DANGER, T.	HANCOCK, J. D.	SHELLEY, SIR J., Bt.
DREWE, MAJOR-GEN. F. E.	LENNARD, SIR J. FARNABY, Bt.	STANFORD, A.
DRUCE, A. F. M.	MARKER, R.	TROYTE, COL.
DUCKHAM, T.		WILLIAMS, E. W.
GIBBONS, G.		

JUDGES' SELECTION.

LUTTRELL, COL. H. A. F. (C.B.), *Chairman.*

ALLEN, J. D.	DRUCE, A. F. M.	MOORE-STEVENS, J. C.
BROWN, W. J.	FOOKES, H.	SHELLEY, SIR J., Bt.
CHORLEY, W. L.	GORRINGE, H.	WILLIAMS, E. W.
DREWE, MAJOR-GEN. F. E.	LENNARD, SIR J. F., Bt.	

IMPLEMENT REGULATIONS.

KNOLLYS, J. E., *Chairman.*

ACLAND, C. T. D. (M.P.)	EDWARDS, C. L. F.	LLEWELLYN, E. H. (M.P.)
BEST, CAPT. J. C. (R.N.)	GIBBONS, G.	NEVILLE-GRENVILLE, R.
DYKE, T.	JONES, H. P.	SHELLEY, SIR J., Bt.

ALLOTMENT.

LUTTRELL, COL. H. A. F. (C.B.), *Chairman.*

BEST, CAPT. J. C. (R.N.)	EDWARDS, C. L. F.	LLEWELLYN, E. H. (M.P.)
	NEVILLE-GRENVILLE, R.	

RAILWAY ARRANGEMENTS.

BRUCE, W. ADAIR, *Chairman.*

AMHERST, EARL	ILCHESTER, THE EARL OF	MORLEY, THE EARL OF.
BUSH, R. H.	KNOLLYS, J. E.	ROLLS, J. A.
CORK, THE EARL OF.	LENNARD, SIR J. F., Bt.	SHELLEY, SIR J., Bt.
COVENTRY, THE EARL OF.	LOPES, SIR M., Bart.	WALROND, SIR J. W., Bt.
DRUCE, A. F. M.		

(With power to add to their number.)

DISQUALIFYING.

THE STEWARDS OF HORSES.	THE STEWARDS OF STOCK.

THE STEWARDS OF POULTRY.

CONTRACTS.

LUTTRELL, COL. H. A. F. (C.B.), *Chairman.*

BEST, CAPT. J. C. (R.N.)	LLEWELLYN, E. H. (M.P.)	SANFORD, E. A.
EDWARDS, C. L. F.	NEVILLE-GRENVILLE, R.	

ARTS AND MANUFACTURES.

ACLAND, Right Hon. Sir T. D., Bart., *Chairman.*
WALROND, Sir J. W., Bart., *Vice-Chairman.*

ACLAND, C. T. D. (M.P.).
BOSCAWEN, Hon. and Rev. J. T., F.L.S.
DAW, R. R. M.
KNOLLYS, J. E.
MOORE-STEVENS, J. C.
MORRELL, G. H.
MURCH, JEROM.
NAPER, Col. W. D.
PHILLPOTTS, Rev. Canon.
WILLIAMS, E. W.
WYATT-EDGELL, A.

(With power to add to their number.)

EXPERIMENTS.

KNOLLYS, J. E., *Chairman.*

ACLAND, Rt. Hn. Sir T. D., Bt.
ACLAND, C. T. D. (M.P.)
DYKE, T.
DRUCE, A. F. M.
GIBBONS, G.
GORRINGE, H.
JONES, H. P.
LENNARD, Sir J. F., Bt.
LLEWELLYN, E. H. (M.P.)
MASKELYNE, N. STORY (M.P.).
PAGET, Sir R. H., Bt. (M.P.)

(With power to add to their number.)

DAIRY.

KNOLLYS, J. E., *Chairman.*

ACLAND, Rt. Hon. Sir T. D., Bart.
ALLEN, J. D.
GIBBONS, G.
GORRINGE, H.
LENNARD, Sir J. F., Bt.
NEVILLE-GRENVILLE, R.
SANFORD, E. A.
WIPPELL, R.

AGRICULTURAL EDUCATION COMMITTEE.

ACLAND, Rt. Hon. Sir T. D., Bart.
ACLAND, C. T. D. (M.P.)
ALLEN, J. D.
AMHERST, EARL.
BOSCAWEN, Hon. and Rev. J. T., F.L.S.
GIBBONS, G.
GORING, Rev. J.
KNOLLYS, J. E.
LENNARD, Sir J. F., Bart.
LLEWELLYN, E. H., M.P.
MASKELYNE, N. STORY, M.P.
PAGET, Sir R. H., Bt., M.P.
SUTTON, M. J.

Stewards.

Yard.
BEST, Capt. J. C. (R.N.)
EDWARDS, C. L. F.
LLEWELLYN, E. H. (M.P.)

Field.
KNOLLYS, J. E. DYKE, T.

Works.
NEVILLE-GRENVILLE, R.

Horses.
LUTTRELL (C.B.), Col. WILLIAMS, E. W.

Stock.
SHELLEY, Sir J., Bt. DRUCE, A. F. M.
DREWE, Major-Gen. LENNARD, Sir J. F., Bart.
F E.

Poultry.
BUSH, R. H. SANDERS, E. J.
EDWARDS, C. L. F. (*Assistant Steward*).

Arts.
NAPER, COL.
CUNDALL, H. M. (*Assistant Steward*).

Horticulture.
BOSCAWEN, Hon. and Rev. J. T., F.L.S.

Music.
TROYTE, Col. NAPER, COL.

Dairy. GIBBONS, G.
Forage. BROWN, W. J.

Shoeing.
LUTTRELL (C.B.), Col.

Treasurer. [illegible]K, H. J.
Local Treasurer. DYMOND, F. W.

Consulting Surveyor.
SPACKMAN, HENRY.

[illegible]intendent of Works.
ROSSITER, J.

[illegible] Chemist.
[illegible] A., F.C.S.

Consulting Botanist.
CARRUTHERS, W., F.R.S.

Editor of 'Journal.'
GOODWIN, JOSIAH.

Auditor.
GOODMAN, A. (*Chartered Accountant.*)

Veterinary Inspector.
BROWN, Prof. G. T. (C.B.)

Secretary—PLOWMAN, THOMAS F.

NEWPORT (MON.) MEETTING, 1888

PATRON.—H.R.H. THE PRINCE OF WALES, K.G

PRESIDENT.—THE RIGHT HON. THE LORD TREDEGAR.

STEWARDS.

Horses.—Colonel H. A. F. LUTTRELL, C.B.; E. W. WILLIAMS.
Cattle, Sheep, and Pigs.—Sir JOHN SHELLEY, Bart.; Major-General F. E. DREWE; A. F. MILTON DRUCE; Sir J. F. LENNARD, Bart.
Working Dairy.—G. GIBBONS.

JUDGES.

HORSES.

Agricultural and Draught.—W. LITTLE, Littleport, Ely; H. SMITH, The Grove, Cropwell Butler, near Nottingham.

Hunters, Hacks, Ponies, and Harness Horses.—M. ANGAS, Cattleholmes, Hull; T. H. D. BAYLY, Edwinstowe House, Newark.

CATTLE.

Devon.—S. BAILEY, Hornshay, Nynehead, Wellington, Somerset; J. FORRESTER, Bryanston, Blandford.

Shorthorn and Dairy.—M. SAVIDGE, Sarsden Lodge Farm, Chipping Norton; J. THOMPSON, Badminton, Chippenham.

Hereford.—W. GROVES, Brompton, Shrewsbury; H. HAYWOOD, Blakemere House, Hereford.

Sussex.—A. AGATE, Grandford House, Horsham; G. NAPPER, Lee Farm, Wisborough Green, Billinghurst.

Jersey.—W. ASHCROFT, Layham's Farm, Hayes, Beckenham; A. T. MATTHEWS, Buckland, Faringdon.

Guernsey.—J. CARRÉ, Millmount, Guernsey; Rev. J. G. S. NICHOL, North Litchfield Rectory, Whitchurch, Hants.

Black Welsh.—T. OWEN, Penmynydd, The Valley, Anglesea; E. VAUGHAN, Plas Rhiw Saeson, Llanbrynmair.

SHEEP.

Leicester, Cotswold, Devon, and other Long-Woolled.—C. CLARKE, Ashby-de-la-Launde, Lincoln; R. GARNE, Aldsworth, Northleach.

South Down, Hampshire Down, and other Short-Woolled.—J. A. HEMPSON, Ewarton Hall, Ipswich; E. BAUNTON, Broadway, Dorchester.

Shropshire, Oxfordshire Down, Horned and Mountain.—C. COXON, Elford Park, Tamworth; W. D. LITTLE, Middleton Stoney, Bicestor, Oxon.

Inspectors of Shearing.—H. MAYO, Cokers Frome, Dorchester; J. B. WORKMAN, Southend, Upton-on-Severn.

PIGS.

J. BARRON, Borrow Field House, Borrowash, Derby; E. BURBIDGE, South Wraxall, Bradford-on-Avon.

DAIRY, &c.

Cheese, Butter, and Cream.—J. ALLEN, Highfield, Shepton Mallet; Prof. CARROLL, Albert Farm, Glasnevin, Dublin; J. WEBB, Brookville, Kensington, W.

Butter Workers and Cream Raising Competitions.—Prof. CARROLL, Albert Farm, Glasnevin, Dublin; T. RIGBY, Sutton Weaver, *viâ* Warrington, Cheshire.

Poultry and Eggs.—J. DIXON, North Park, Clayton, Bradford; W. B. TEGETMEIER, 346, Strand, London, W.C.

Horse Shoeing.—T. D. BROAD, Broad Street, Bath.

AWARDS OF PRIZES FOR STOCK, 1888.

***** An animal designated in this list as the "reserve number" will be entitled, *conditionally*, to succeed to any prize that may become vacant in its class by reason of the animal placed above it by the Judges failing afterwards to qualify.**

† Animals, where not otherwise stated, may be considered to have been bred by the Exhibitor.

ABBREVIATIONS EXPLAINED:—S., sire; d., dam; g. d., grand dam; y., year; m., month; w., week; d., day.

HORSES.

FOR AGRICULTURAL PURPOSES.

CLASS 1.—*Stallion, foaled before* 1886. Six entries.

First Prize, 25*l.*; Colonel H. PLATT, Gorddinog, Llanfairfechan, North Wales, brown Shire, *Carbon* (3523), 5 y., 1 m.; bred by Earl of Ellesmere, Worsley, Manchester; s., Lincolnshire Lad 2nd; d., Diamond.

Second Prize, 10*l.*; LORD TREDEGAR, Tredegar Park, Newport, Monmouthshire, Grey Shire, *The Pope* (4738), 4 y.; bred by Earl of Ellesmere; s., Lincolnshire Lad 2nd (1365), d., Abbess, s. of d., Lincoln (1348).

Reserve, T. CHAPMAN, Orchard Portman, Taunton, roan Shire, *Blagdon Bang Up* (4875), 3 y.; bred by Earl of Ellesmere, Chatteris, Cambridge; s., Esquire (2774); d., Ellesmere's Venture (vol. vii.); s. of d., England's Wonder (761).

CLASS 2.—*Stallion foaled in* 1886. Five entries.

First Prize, 20*l.*; EARL OF CAWDOR, Stackpole Court, near Pembroke, bay Clydesdale, *Macbeth*, 2 y.; bred by G. Anderson, West Tengask, Old Meldrum; s., McCamon (3818); d., Octoroon (3073); s. of d., Premier Prince (1459).

Second Prize, 10*l.*; C. KEEVIL, Blagdon, Malden, Surrey, grey Shire, *Peasant Boy*, (6255), 2 y.; bred by G. F. Ogle, Jun., Bankside House, Thorne, Doncaster, Yorkshire; s., Lincolnshire Lad 2nd (1365); d., Mettle-Ogles; s. of d., Sir Roger (2026).

Reserve, W. GILBEY, Elsenham Hall, Essex, brown Shire, *Magical Tom*, 2 y.; s., Manchester Tom (3851); d., Magdalen Beauty; s. of d., Brown George (319).

Commended, J. POWELL, Upper Wick, Worcester, dark grey Shire, *Briton Yet*, 2 y., 2 m.; bred by W. Farrow, Barton Drove, Wisbeach, Lincolnshire; s., True Briton (2684), s. of d., Cloot (3020).

CLASS 3.—*Colt, foaled in* 1887. Five entries.

First Prize, 10*l.*; J. S. HODGSON, Lythe Hill, Haslemere, Surrey, bay [illegible]lydesdale, 1 y., 1 m.; s., Merry Monarch (538); d., Lorna (3704); s. of d., [illegible]ck Watch (64).

[illegible]cond Prize, 5*l.*; S. SHARP, Thornwell Farm, Chepstow, bay Shire, *Right* [illegible] y., 1 w., 3 d.; s. Field Marshal.

[illegible]LASS 4.—*Mare and Foal, or in Foal.* Three entries.

[illegible] rize, 15*l.*; EARL OF CAWDOR, Stackpole Court, Pembroke, dark bay [illegible]esdale, in-foal, *Snowdrop*, 4 y., 1 m.; s., Sir Joseph (3196), d., Maid of [illegible] West (3330); s. of d., Star of the West (828).

[illegible]econd Prize, 10*l.*; H. WILLIAMS, Stormy Farm, Pyle, near Bridgend, [illegible] Shire, and Foal, *Darby*, 9 y., 1 m., 2 d.; s. Shropshire Friend; d., Brunel; [illegible]d., King of Vale.

CLASS 5.—*Filly, foaled in* 1885. Four entries.

First Prize, 10*l.*; LORD WANTAGE, K.C.B., V.C., Lockinge, Wantage, Berks, brown Shire, *The Forest Queen*, 3 y.; bred by W. W. McGibbin, Rangemore, Burton-on-Trent; s., Royal Albert (1885); d., Madam; s. of d., Hercules (1022).

Second Prize, 5*l.*; H. WILLIAMS, Stormy Farm, Pyle, near Bridgend, bay Shire, *Brunel*, 3 y., 2 m., 2 w., 3d.; s., Young Honest Tom; d., Boll; s. of d., Agricultural.

Reserve, EARL OF CAWDOR, Stackpole Court, near Pembroke, bay Clydesdale, *Snowdrift*, 2 y., 11 m., 1 w.; s. Sir Joseph (3196); d. Fanny (1872); s. of d., Prince of Kilbride (1268).

CLASS 6.—*Filly, foaled in* 1886. Eleven entries.

First Prize, 10*l.*; LORD WANTAGE, K.C.B., V.C., Lockinge, Wantage, bay Shire, *Lady Lorraine*, 2 y., 1 m.; s., Electric (3069); d., Encore, s. of d., Admiral (71).

Second Prize, 5*l.*; C. E. GALBRAITH, Honington Hall, Grantham, chestnut Shire, *Lady Garnet*, 2 y.; bred by G. Budibent, Wells, Alford, Lincolnshire; s., Sir Garnet (4037); d., Flower; s. of d., Hydraulic (1130).

Reserve and Highly Commended, J. S. HODGSON, Lythe Hill, Haslemere, Surrey, brown Clydesdale, *Blanche*, 2 y., 3 w., 1 d.; bred by Marquis of Londonderry, Seaham Harbour; s., Go Bang (3656); d., Bonny; s. of d., Fashion o' the Day (1655).

Highly Commended, W. GILBEY, Elsenham Hall, Essex, bay Shire, *Giddy Girl*, 2 y.; s., Spark (2497); d., Merry Girl; s. of d., Merry Lad (2926): and EARL OF CAWDOR, Stackpole Court, near Pembroke, bay Clydesdale, *Snowflake*, 1 y., 11 m., 3 w., 1 d.; s., Sir Joseph (3196); d., Adelaide (4477); s. of d., What care I (912).

The Class Commended.

CLASS 7.—*Pair of Horses (Mares or Geldings), the property of a Tenant Farmer in the County of Monmouth.* One entry.

First Prize, 10*l.**; J. S. ADAMS, Crick Farm, near Chepstow, Monmouthshire, bay and brown Cart mares, *Darling* and *Leicester*, 4 and 5 y.; s., Young Sir Robert; d., Brock.

DRAUGHT.

CLASS 8.—*Mare or Gelding, suitable for underground work.* Three entries.

First Prize, 15*l.**; EARL OF CAWDOR, Stackpole Court, Pembroke, grey Clydesdale mare, *Mary of Stackpole* (6038), 5 y.; bred by J. Speir, Bolgreen, Lochwinnsen; s. Pride of Galloway (1245); d., Bolgreen (5054), s. of d., Young Lorne (997).

Second Prize, 10*l.**; J. FRANCIS, Great House Farm, Llangeview, Usk, black Cart mare, *Stout*, 5 y.; s., Raglan Hero; d., Darby; s. of d., King of the Vale.

Third Prize, 5*l.*; W. LOWRIE, Radyr Farm, Cardiff, dark bay Cart mare, *Lively*, 7 y.; s., Young Agriculturist; d., Brown.

HUNTERS.

CLASS 9.—*Mare or Gelding, foaled before* 1884, *up to* 14 *stone.* Five entries.

First Prize, 25*l.*; J. V. KEEVIL, Shaw Farm, Melksham, chestnut Gelding, *Conundrum*, 6 y.; s. New Oswestry; d., Judy; s. of d., Prime Minister.

* Given by Newport Local Committee.

Second Prize, 10*l.*; W. G. CANNING, Maindiff Court, Abergavenny, bay Gelding, *Llanthony*, 5 y.

Reserve, W. P. JONES, Elmsbridge, Redland Road, Bristol, chestnut gelding, *The Boss*, 5 y. off; bred by J. R. Grigg, Nantellan, Grampound, Cornwall; s., Odd Trick; d., Topsey; s. of d., Uncommon.

CLASS 10.—*Mare or Gelding, foaled before* 1884, *up to* 12 *stone.* Five entries.

First Prize, 25*l.*; J. L. J. PARTRIDGE, Nymett Rowland, near Morchard Bishop, Devon, brown Mare, *Stockove*, 5 y.; s., Stockinger.

Second Prize, 10*l.*; A. STEVENS, Penhill, Cardiff, grey Gelding, *Cabin Boy*, 6 y.

CLASS 11.—*Mare or Gelding, foaled in* 1884. Thirteen entries. One withdrawn.

First Prize, 20*l.*; R. O. REES, Bronllys Court, Talgarth, R.S.O., bay, *Willersley*, 4 y., 3 w.; bred by J. Marston, Lady Arbour, Gardesley, Hereford; s., Merry Go Round; s. of d., Jack of Newbury.

Second Prize, 10*l.*; S. C. KEEVIL, Bourton, Shrivenham, bay Gelding, *Sportsman*, 4 y.; bred by W. Matthews, Swindon; s., Ladbroke; d., Umpire.

Reserve, W. TILL, Treworgan, Ross, chesnut Filly, *Sunbeam*, 4 y., 1 m., 2 w.; bred by Rev. J. H. Potts, Lagarren, Ross; s., Munchausen; d., by Blair Athol.

CLASS 12.—*Filly or Gelding, foaled in* 1885. Seven entries. One withdrawn.

First Prize, 10*l.*; A. R. BOUGHTON-KNIGHT, Downton Castle, Ludlow, brown Gelding, *Regal*, 3 y., 2 w., 5 d.; s., Prince George; d., by Merryman.

Second Prize, 5*l.*; W. A. VILLAR, New Court, Charlton Kings, brown Gelding, *Early Bird*, 3 y.; s., The Mallard; d., Lady Price.

Reserve, J. RANKIN, M.P., Bryngwyn, Tram Inn, R.S.O., bay Gelding *Lucifer*, 3 y., 1 m., 3 w., 3 d.; s., MacCalmount; d., Ladybird; s. of d., British Statesman.

CLASS 13.—*Filly or Gelding, foaled in* 1886. Thirteen entries.

First Prize, 10*l.*; D. PUGH, M.P., Manoravon, Llandilo, Carmarthenshire, bay Gelding, 2 y., 3 w., 5 d.; s., Shifnal; d., Polly; s. of d., Christmas Carol.

Second Prize, 5*l.*; Major-General H. E. WATSON, Croesonnen, Llangibby, Newport, Monmouthshire, chestnut Gelding, *Minstrel*, 2 y., 3 m.; bred by Mr. Smith, Rendlesham; s., Border Minstrel; d., Blacklock Mare.

Reserve, Major E. N. HEYGATE, Buckland, Leominster, Hereford; chestnut Gelding, *Skylark*, 2 y., 6 m.; s., Bookworm; d., Zazel, by Truant.

CLASS 14.—*Filly or Colt, foaled in* 1887. Seventeen entries. One withdrawn.

First Prize, 10*l.*; Major E. N. HEYGATE, Buckland, Leominster, Hereford, chestnut Colt, *Rambler*, 1 y., 1 m., 2 w., 2 d.; s., Moriturus; d., Tripp.

Second Prize, 5*l.*; W. A. DYKE, Honeybourne Grove, Broadway, Worcester, brown Colt, 1 y., 1 w.; s., Munchausen; s. of d., Anthracite.

Reserve, A. E. W. DARBY, Little Ness, Shrewsbury, bay Gelding, 1 y., 2 m., 2 w.; s., Mustapha; d., Ida.

CLASS 15.—*Mare and Foal, or in-Foal.* Five entries.

First Prize, 20*l.*; R. J. MANN, Home Farm, Acton Burnell, Salop, black, *Maid of Mowbray*, 9 y.; bred by Mr. Noton, Topcliff, Thirsk; s., Baron Cavendish; d., by Amderly.

Second Prize, 10*l.*; Captain FIFE, Sandley House, Gillingham, bay, and Foal, *Mermaid*, aged; s., Baron Cavendish; d. by The Dean.

Reserve, R. SWANWICK, R.A. College Farm, Cirencester, bay, and Foal, *Forbidden Fruit*, 17 y.; bred by W. T. Sharp; s., Delight; d., Lady Fanny; s. of d., Hobbie Noble.

HACKS.

CLASS 16.—*Mare or Gelding, over* 14·2 *hands.* Five entries.

First Prize, 10*l.*; A. E. EVANS, Bronwylfa, Wrexham, brown Mare, *Viscountess*, 8 y.; s., Confidence.

Second Prize, 5*l.*; Lord TREDEGAR, Tredegar Park, Newport, Monmouthshire, brown Mare, *May Queen*, 4 y.; s., Makehaste; d., May Queen.

Reserve, J. TUCKER, Tyclyd, near Cardiff, roan Mare, *Duchess*, 4 y., 6 m.; bred by J. Gwillam, Waterstone.

CLASS 17.—*Mare or Gelding, under* 14·2 *hands.* Five entries.

First Prize, 10*l.*;* E. JONES, Bryngan, Llandilo, dark bay Mare, *Betty*, 6 y.; bred by D. Pugh, Manoravon, Llandilo; s., Jenkynbach; d., Bettyfach.

Second Prize, 5*l.*;* EARL OF CAWDOR, Stackpole Court, Pembroke, dark bay Gelding, *The Dandy*, 3 y., 1 w.; bred by Exhibitor; s., The Gentleman; d., Mary Anne; s. of d., Tom Moody.

CLASS 18.—*Mare and Foal, or in Foal, not over* 14·2 *hands.* 1 entry.

First Prize, 7*l.*; LORD TREDEGAR, Tredegar Park, Newport, Monmouthshire, brown, and Foal, *Mary Ann*, aged; s., Tom Moody.

Second Prize, 3*l.*; No competition.

PONIES.

CLASS 19.—*Mare or Gelding, not over* 13 *hands.* Three entries. One withdrawn.

First Prize, 7*l.*; J. H. CLIFTON, Upland House, Keynsham, bay, *The Duke*, 4 y., 7 m.

CLASS 20.—*Mare and Foal, or in-Foal, not over* 13 *hands.* First Prize, 5*l.* Second Prize, 3*l.*

[No competition.]

HARNESS.*

CLASS 21.—*Mare or Gelding, over* 15·2 *hands.* First Prize, 10*l.* Second Prize, 5*l.*

[NO ENTRY.]

CLASS 22.—*Mare or Gelding, over* 14 *hands and not over* 15·2. Four entries.

First Prize, 10*l.*; L. YORATH, Maeswawr Farm, Talybont, Bwlch, R.S.O. dun Mare, *Princess*, 6 y.; bred by W. Jenkins, Rhoose, Penmark, near Cowbridge; s., Morning Star; d., Polly; s. of d., Cymro Back.

Second Prize, 5*l.*; R. O. REES, Bronllys Court, Talgarth, R.S.O., brown Mare, *Lady Clyde*, 5 y.; bred by W. T. Lewis, West Davey, Haverfordwest; s., Lord Clyde; s. of d., Freetrade.

Reserve, F. HARRISON, Clehonger Court, near Hereford, chestnut Gelding, *Tommie*, 4 y.; bred by — Watkins, Dolwin, Peterchurch.

CLASS 23.—*Mare or Gelding, over* 13 *hands and not over* 14. Three entries.

First Prize, 10*l.*; A. E. EVANS, Bronwylfa, Wrexham, brown chestnut Gelding, *Viscount*, 5 y.; s., Little Tommy.

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* Given by Newport Local Committee.

Second Prize, 5*l.*; W. P. JONES, Elmsbridge, Redland Road, Bristol, grey Mare, *Stella*, 5 y.; bred in Ireland.

Reserve, J. M. LEWIS, 16, Castle Road, Cardiff, chestnut Gelding, *Mystery*, 4 y., 11 m., 3 w.; s., Young Defence; d., Mountain Pony.

CLASS 24.—*Mare or Gelding, under* 13 *hands.* Five entries.

First Prize, 7*l.*; J. H. CLIFTON, Upland House, Keynsham, brown, *The Prince*, 6 y., 8 m.

Second Prize, 3*l.*; H. O. FISHER, Llandough, near Cardiff, bay mountain Gelding, *Taffy*, 5 y., 1 m.; bred by W. H. Mathias, Porth, Pontypridd; s., Express Lion; d., Little Gipsy.

Reserve, L. BARNETT, 36, Charles Street, Cardiff, dun, *Princess*, aged.

CATTLE.

(*All ages calculated to the* 6*th of June*, 1888.)

DEVON.

CLASS 25.—*Bull calved in* 1884 *or* 1885. Two entries.

First Prize, 20*l.*; R. BICKLE, Bradstone Hall, Tavistock, red, *Master Prim 2nd* (2080), 3 y., 5 m., 2 d.; s., Lord Somerset (1788); d., Primrose 2nd (5608); s. of d., Dolly's Duke (1315).

Second Prize, 10*l.*; Sir W. WILLIAMS, Bart., Heanton, Barnstaple, N. Devon, red, *Foreman 2nd*, 3 y., 6 m.; s., Duke of Flitton 17th (1544); d., Temptress 8th (5001); s. of d., Duke of Flitton 10th (1074).

CLASS 26.—*Bull calved in* 1885. Five entries.

First Prize, 20*l.*; R. BICKLE, Bradstone Hall, Tavistock, red, *Fancy's Robin 2nd*, 2 y., 2 m., 1 w., 2 d.; s., Gladstone (1737); d., Fancy (5297); s. of d., Stockley Prince (1454).

Second Prize, 10*l.*; J. FARTHING, Currypool, Bridgwater, red, *Lord Quantock*, 2 y., 1 w., 2 d.; s., Master Walter (1808); d., Lady Liddon 1st (6270); s. of d., son of Profit's Duke (1194).

Reserve and Highly Commended, J. HOWSE, Stamborough, Washford, R.S.O., Somersetshire, red, *The Vicar* (2156), 5 y., 4 m., 3 w.; s., Druid (1317); d., Lily 6th (5479); s. of d., Young Profit's Duke.

CLASS 27.—*Bull calved in* 1887. Six entries.

First Prize, 15*l.*; J. FARTHING, Currypool, Bridgwater, red, *Robin Hood*, 1 y., 2 m., 1 w.; s., Master Walter (1808); d., Robin's Duchess 3rd (6293); s. of d., Royal Duke (1640).

Second Prize, 10*l.*; W. H. PUNCHARD, Bourton Hall, Totnes, Devon, red, *The Colonel*, 1 y., 2 m., 3 w., 6 d.; s., Lord Currypool (1589); d. Beatrice; s. of d., Romany Rye 2nd.

Reserve and Commended, R. BICKLE, Bradstone Hall, Tavistock, red, *Actor*, y., 2 m., 1 w., 6 d.; s., Gladstone (1737); d., Actress 2nd (5946); s. of d., Narcissus.

CLASS 28.—*Cow, in-Milk or in-Calf, calved before* 1885. Four entries.

First Prize, 15*l.*; J. HOWSE, Stamborough, Washford, R.S.O., Somerset, red, *...sy* (5815), 6 y., 5 m., 2 w., 1 d.; bred by Viscount Portman, Bryanston, Blandford; s., Shamrock (1643); d., Damsel (4380); s. of d., Prince Albert (907).

Second Prize, 10*l.*; A. C. SKINNER, Pound Farm, Bishop's Lydeard, red, *Duchess 12th* (8984), 3 y., 9 m., 3 w., 5 d.; s., Lord Currypool (1589); d., Duchess 7th (5260); s. of d., Duke of Farrington (1323).

Reserve and Highly Commended, Sir W. WILLIAMS, Bart., Heanton, Barnstaple, red, *Fairmaid*, 4 y., 3 m., 2 w.; s., Duke of Flitton 17th (1544); d., Gentle (5878).

Highly Commended, W. H. PUNCHARD, Bourton Hall, Totnes, Devon, red, *Norah 7th* (7171), 5 y., 1 m., 2 w., 5 d.; bred by J. Surridge, Bishop's Lydeard; s. Lord Currypool (1589); d., Norah 2nd (7167); s. of d., Admiral (1267).

CLASS 29.—*Heifer, in-Milk or in-Calf, calved in* 1885. Three entries.

First Prize, 15*l.*; A. C. SKINNER, Pound Farm, Bishop's Lydeard, red, *Lady Passmore 4th* (9000), 3 y., 3 m., 2 w., 1 d.; s., Lord Cutsey 2nd (1767); d., Lady Passmore 3rd (7013); s. of d., Lord Stowey (1601).

Second Prize, 10*l.*; E. J. STANLEY, M.P., Quantock Lodge, Bridgwater, red, *Picture 5th* (7097), 3 y., 1 m., 2 w., 3 d.; s., General Colley (1564); d., Picture 4th (4818); s. of d., Jack (1128).

Reserve and Commended, J. HOWSE, Stamborough, Washford, Taunton, red, *Cowslip* (8226), 2 y., 11 m., 3 w., 6 d.; s., Druid (1317); d., Dairymaid 3rd (8228).

CLASS 30.—*Heifer calved in* 1886. Eight entries.

First Prize, 10*l.*; R. BICKLE, Bradstone Hall, Tavistock, red, *Jessie 2nd* (7427), 1 y., 10 m., 2 w., 3 d.; s., Gladstone (1737); d., Jessie (4578); s. of d., Earl of Hexworthy (1091).

Second Prize, 5*l.*; Sir W. WILLIAMS, Bart., Heanton, Barnstaple, red, *Flower 2nd*, 2 y., 4 d.; s., Eclipse (1728); d., Flower 8th (4502); s. of d., Young Palmerston (1251).

Reserve and Highly Commended, W. H. PUNCHARD, Bourton Hall, Totnes, Devon, red, *Norah 11th* (9151), 2 y., 4 w.; bred by J. Surridge, Bishop's Lydeard; s., Druid (1317); d., Norah 7th (7171); s. of d., Lord Currypool (1589).

Highly Commended, Sir W. WILLIAMS, Bart., red, *Georgina 2nd*, 1 y., 8 m.; s., Sir Michael (1646); d., Georgina (5879).

Commended, W. H. PUNCHARD, red, *Buttercup 5th* (9309), 1 y., 11 m., 3 w., 1 d., bred by J. Walter, Bearwood, Wokingham; s., Lord Stowey (1601); d., Buttercup 4th (5136); s. of d., Lily's Robin (1582):—E. J. STANLEY, M.P., Quantock Lodge, Bridgwater, red, *Princess 2nd*, 2 y., 2 m., 3 w., 5 d.; s., General Colley (1564); d., Princess Beatrice:—and R. BICKLE, red, *Betty 4th* (7406), 2 y., 1 m., 1 w., 6 d.; s., Gladstone (1737); d., Betty 2nd (5953); s. of d., Narcissus (1617).

CLASS 31.—*Heifer calved in* 1887. Eight entries.

First Prize, 10*l.*; R. BICKLE, Bradstone Hall, Tavistock, red, *Lady Florence*, 1 y., 5 m.; s., Champion (1696); d., Lady Somerset (5966).

Second Prize, 5*l.*; Sir W. WILLIAMS, Bart., Heanton, Barnstaple, red, *Daisy 4th*, 1 y., 5 m.; s., Sir Michael (1646); d., Daisy 3rd (9348); s. of d., Duke of Flitton, 17th (1544).

Reserve and Very Highly Commended, A. C. SKINNER, Pound Farm, Bishop's Lydeard, red, *Myrtle 28th*, 11 m., 2 w.; s., Lord Currypool (1589); d., Myrtle 6th (5543); s. of d., Duke of Farrington (1323).

Very Highly Commended, Sir W. WILLIAMS, Bart., red, *Foam 3rd*, 1 y., 2 d.; s., Foreman (1968); d., Lady Currypool (5430); s. of d., Profit's Duke (1194).

Highly Commended, A. C. SKINNER, red, *Myrtle 25th*, 1 y., 2 m., 1 w., 2 d.; s., Lord Currypool (1589); d., Myrtle 9th (5546); s. of d., Duke of Farrington (1323).

Commended, W. H. PUNCHARD, Bourton Hall, Totnes, Devon, red, *Gentle 24th*, 1 y., 1 m., 3 w., 2 d.; bred by A. C. Skinner, Bishop's Lydeard; s., Lord

Currypool (1589); d., Gentle 16th (7009); s. of d., Fancy's Robin (1556):—E. J. STANLEY, M.P., Quantock Lodge, Bridgwater, red, *Sarah 4th*, 1 y., 3 m., 2 w., 6 d.; s., General Colley (1564); d., Sarah (4944); s. of d., Profit's Duke (1194):—and his red, *Picture 7th*, 1 y., 4 m.; s., General Colley (1564); d., Picture 4th; s. of d., Jack (1128).

SHORTHORNS.

CLASS 32.—*Bull calved in* 1884 *or* 1885. Twelve entries, one withdrawn.

First Prize, 20*l.*, and Champion Prize, as Best Bull in the Shorthorn Classes, 10*l.*; C. W. BRIERLEY, Rosedale, Tenbury, Worcestershire, roan, *Aristocrat*, 4 y., 4 m., 1 d.; bred by G. W. Lambart, Beaupare, Neath; s., Nobleman 2nd (48,363); d., Albatross; s. of d., Jupiter (38,477).

Second Prize, 10*l.*, J. HANDLEY, Greenhead, Milnthorpe, Westmoreland, red, *Chief Justice* (54,098), 2 y., 2 m., 26 d.; bred by J. Vickers, Catchburn, Morpeth; s., Ingram's Chief (51,423); d., Purity; s. of d., Duke of Howl John (33,674).

Reserve and Highly Commended, J. HANDLEY, red and little white, *Macbeth* (54,676), 3 y., 1 m., 7 d.; bred by J. A. Gordon, Arabella, Ross-shire, N. B.; s., Macgregor (50,001); d., Bessie Bell; s. of d., Rosario (35,315).

Commended, R. STRATTON, The Duffryn, Newport, Monmouth, white, *Pilot* (51,837), 3 y., 6 m., 2 w., 5 d.; s. Acropolis (47,316); d., Primula; s. of d., Crowned Victor (36,408):—EXECUTORS of the late L. PONSONBY, Terrick, Tring, white, *Prince Arthur* (51,869), 3 y., 6 m., 6 d.; bred by W. Taylor, Hall Garth; s., Lord Ormskirk's Gwynne (41,905); d., Lady of Nunwick 2nd; s. of d., Hubback Junior (31,395):—and J. GARNE, Great Rissington, S.O., Glo's., roan, *Prince of Aldsworth* (53,453), 4 y., 3 m., 3., 3 d.; bred by R. Garne, Aldsworth, Northleach; s., Lord Frogmore (46,651); d., Skylark's Magic; s. of d. Skylark (37,489).

CLASS 33.—*Bull calved in* 1886. Ten entries.

First Prize, 20*l.*, and Reserve for Champion Prize; J. THOMPSON, Elswick, Poulton-le-Fylde, Lancashire, red and white, *Fylde Ingram* (54,333), 1 y., 11 m., 3 d.; bred by T. Shaw, The Island, Winmarleigh, Garstang; s., Royal Ingram (50,374); d., Diana 8th; s. of d., Romulus (45,478).

Second Prize, 10*l.*; J. HANDLEY, Greenhead, Milnthorpe, red and white, *Self Conceit* (55,026), 2 y., 3 m., 11 d.; bred by W. Handley, Green Head, Milnthorpe; s., Self Esteem 2nd (48,675), d., Derwent Queen; s. of d., Baron Stackhouse (30,488).

Reserve and Highly Commended, J. D. WILLIS, Bapton Manor, Codford, Wilts, roan, *Rissington Lad 5th*, 1 y., 10 m., 3 w., 6 d.; bred by J. Garne, Great Rissington; s., Prize Winner (51,938); d., Rocking Girl; s. of d., Duke of Cambridge (33,587).

Highly Commended, J. HANDLEY, roan, *Golden Treasure 2nd* (54,378), 1 y., 10 m., 1 d.; bred by W. Handley, Green Head, Milnthorpe; s., Golden Treasure (51,346); d., Red Rose of Green Head; s. of d., Master Harbinger (40,324).

Commended, W. CHAPMAN, Trewithian House, Gerrans, Grampound Road, Cornwall, red roan, *Young Earl of Oxford*, 1 y., 11 m., 3 w., 5 d.; s., Earl of Oxford (51,185); d., Red Rose; s. of d., Lord of the Manor (40,222):—and W. H. TREMAINE, Sherborne, Northleach, Cheltenham, white, *Earl of Clarence*, 1 y., 6 m., 2 w., 6 d.; s., Earl of Oxford (51,185); d., Ruth Clarence VI.; s. of d., Viscount Wild Eyes.

CLASS 34.—*Bull calved in* 1887. Fifteen entries. 1 withdrawn.

First Prize, 15*l.*; J. HANDLEY, Green Head, Milnthorpe, white, *Roseberry*, 2 m. 20 d.; bred by Lord Loval, Beaufort Castle, Beauly, N.B.;

s., Bannockburn (49,035); d., Groan Duchess; s. of d., Duke of Beaufort (38,122).

Second Prize, 10*l.*; Colonel KINGSCOTE, C.B., Kingscote, Wootton-under-Edge, red and little white, *Count Bickerstaffe 18th*, 1 y., 3 m., 2 d.; s., George Saladin 2nd (51,331); d., Lady Bickerstaffe 4th; s. of d., Cowslip Boy (38,051.)

Reserve and Highly Commended, R. STRATTON, The Duffryn, Newport, Monmouth, roan, *Ignoci*, 1 y., 2 m., 2 w.; s., Victor (52,297); d., Rosy Gem; s. of d., Pearl Diver (37,182).

Highly Commended, J. GARNE, Great Rissington, S.O., Gloucestershire, roan, *Rissington Lad 6th*, 1 y., 3 m., 2 w., 4 d.; s., Baronet (52,459); d., Rissington Girl; s. of d., British Prince (37,907):—and J. D. WILLIS, Bapton Manor, Codford, Wilts., roan, *Paragon Baron*, 1 y., 2 m., 3 w., 4 d.; bred by J. Garne, Great Rissington; s., Baronet (52,459); d., Parisienne; s. of d., Scarlatti (39,085).

Commended, W. CHAPMAN, Trewithian House, Gerrans, Grampound Road, Cornwall, red and little white, *Red Duke*, 1 y., 4 m., 3 w., 3 d.; s., Duke of Hayle 32nd (46,241); d., Laburnam 31st; s. of d., Lord Oxford (29,189): —W. H. TREMAINE, Sherborne, Northleach, Cheltenham, roan, *Baron Clarence 2nd*, 11 m., 3 d.; s., Benbicula (45,970); d., Ruth Clarence 1st; s. of d., General Clarence 2nd (28,690): —and LORD FITZHARDINGE, Berkeley Castle, Berkeley, red, *Lord Clive*, 1 y., 2 m., 2 w., 1 d.; s., Duke of Wellington 2nd (52,791); d., Duchess of Cleveland 4th; s. of d., Grand Duke of Worcester 2nd (43,323).

CLASS 35.—*Cow, in-Milk or in-Calf, calved before* 1885. **11 entries.**

First Prize, 15*l.*, and Champion Prize, 10*l.*, for best Cow or Heifer in the Shorthorn Classes, W. HOSKEN and SON, Loggans Mill, Hayle, Cornwall, roan, *Alexandria 9th*, 4 y., 5 m., 4 d.; s., Grand Duke of Oxford 5th (43,318); d., Alexander 5th; s. of d., Prince of Oxford (42,212).

Second Prize, 10*l.*, C. W. BRIERLEY, Rosedale, Tenbury, Worcestershire, roan, *Lady Worsley*, 4 y., 5 m., 3 d.; bred by J. Rowley, Vine Cottage, Norton, Doncaster; s., Self Esteem 2nd (48,675); d., Dewdrop, s. of d.; Paul Potter (38,854).

Reserve and Highly Commended, A. E. W. DARBY, Little Ness, Shrewsbury, white, *Lady Leoline*, 6 y., 6 m., 2 w., 3 d.; s., King Harold (40,053); d., Leoline 4th; s. of d., Sir Windsor Broughton (27,507).

Highly Commended, T. E. WALKER, Studley Castle, Warwickshire, roan, *Baroness 3rd*, 4 y., 2 m., 1 w., 3 d.; s., Red Duke (48,553); d., Baroness; s. of d., Grand Duke of Studley 2nd (39,954).

Commended, LORD TREDEGAR, Tredegar Park, Newport, Monmouthshire, roan, *Cherry Pie 4th*, 9 y., 4 m., 20 d.; s., Mustapha (34,888); d., Cherry Pie; s. of d., James 2nd (24,203).

CLASS 36.—*Heifer, in-Milk or in-Calf, calved in* 1885. **6 entries.**

First Prize, 15*l.*; C. W. BRIERLEY, Rosedale, Tenbury, Wercestershire, roan, *Victoria*, 2 y., 7 m., 1 w., 3 d.; bred by Earl Spencer, K.G., Althorpe Park, Northampton; s., Darnley (47,678); d., Cowslip; s. of d., Javelin (46,530).

Second Prize, 10*l.*; EXECUTORS of the late L. PONSONBY, Terrick, Tring, red, *Darling Daisy*, 3 y., 2 m., 4 w.; bred by C. H. Bassett, Pilton House, Barnstaple; s., Baron Oxford 3rd (42,737); d., Delight; s. of d., Barmpton (32,994).

Reserve and Highly Commended, T. E. WALKER, Studley Castle, Warwickshire, red, *Fanchette*, 2 y., 9 m., 1 w., 5 d.; bred by C. Hobbs, Maisey Hampton, Fairford; s., Devonshire (47,686); d., Fanny 6th; s. of d., 7th Colonel Tregunter (30,769).

Commended, J. A. ROLLS, The Hendre, Monmouth, red and little white, *Zoolite,* 2 y., 7 m., 3 w., 6 d.; s., Prince of Waterloo 4th (48,531); d., Zoetrope; s. of d., Churchill (37,996).

CLASS 37.—*Heifer, calved in* 1886. Twelve entries.

First Prize, 10*l.*, and Reserve for Champion Prize; Rev. R. B. KENNARD, Marnhull Rectory, Blandford, roan, *Lady Marnhull 19th,* 2 y., 4 m., 3 w., 1 d.; s., Lord Marnhull 3rd (49,939); d., Lady Marnhull 17th; s. of d., Montrose (45,261).

Second Prize, 5*l.*; R. STRATTON, the Duffryn, Newport, roan, *Rosy Morn,* 2 y., 2 m., 2 w., 2 d.; s., Hopeful (49,731); d., Rosy Gem; s. of d., Pearl Diver (37,182).

Reserve and Highly Commended, EXECUTORS of the late L. PONSONBY Terrick, Tring, roan, *Nancy Lee,* 2 y., 4 m., 1 w., 4 d.; bred by the Hon. F. W. ANSON, Cell Barnes, St. Albans; s., Duke of Nunwick (47,776); d., Alice Lee; s. of d., Pompey (35,059).

Highly Commended, J. GARNE, Great Rissington, S.O., Gloucestershire, red, *Lady Ebury 5th,* 2 y., 4 m., 3 w., 3 d.; s., Jingo 5th (51,440); d., Epitaph 27th; s. of d., Numa (34,931):—LORD TREDEGAR, Tredegar Park, Newport, Monmouthshire, roan, *Tulip 9th,* 1 y., 6 m.; s., Bellerophon (47,472); d., Tulip 4th; s. of d., Mustapha (34,888):—and C. W. BRIERLEY, Rosedale, Tenbury, white, *Rosedale Grace,* 1 y., 6 m., 4 d.; s., Madrigal (51,694); d., Rosedale Nun; s. of d., Rosedale Oxford (48,597).

Commended, LORD TREDEGAR, roan, *Cherry Blossom,* 2 y., 13 d.; s., Bellerophon (47,472); d., Cherry Pie 4th; s. of d., Mustapha (34,888):—and R. STRATTON, roan, *Llanwern 22nd,* 1 y., 9 m., 3 w.; s. Victor (52,297); d. Llanwern 12th; s. of d., Lowlander (37,022).

CLASS 38.—*Heifer calved in* 1887. Fourteen entries.

First Prize, 10*l.*; W. HOSKEN and SON, Loggans Mill, Hayle, Cornwall, red, *Miss Ada 26th,* 1 y., 2 m., 1 w., 6 d.; s., Grand Duke of Oxford 5th (43,318); d., Miss Ada 16th; s. of d., Grand Duke 34th (41,642).

Second Prize, 5*l.*; C. W. BRIERLEY, Rosedale, Tenbury, white, *Rosedale Graceful,* 1 y., 4 m., 3 w.; s., Ruckley (50,398); d., Rosedale Snowflake; s. of d., Rosedale Oxford (48,597).

Reserved and Highly Commended, W. WEBB, Thickwood, Colerne, Wilts, roan, *May Carew,* 1 y., 3 m., 2 w.; s., Baronet (52,459); d., Hawthorn; s. of d., Sir Arthur Windsor (35,541).

Highly Commended, J. GARNE, Great Rissington, S.O., Gloucestershire, white, *Carew Pansy,* 9 m., 2 w., 2 d.; s., Baronet (52,459); d., Frogmore Pansey; s. of d., Sir Robert Frogmore (40,719):—and T. E. WALKER, Studley Castle, Warwickshire, roan, *Gladys,* 1 y., 1 m., 2 w., 3 d.; bred by T. Stokes, Warmington Oundle; s., Lord Gladys (53,158); d., Sequence; s. of d., Earl of Waterloo (49,516).

Commended, J. D. WILLIS, Bapton Manor, Codford, roan, *Stella,* 1 y., 5 m.; s., Gracchus (51,352); d., Snowdrop; s. of d., Lazarus (45,039):—and Sir H. HUSSEY VIVIAN, Bart., M.P., Park Le Breos, Swansea, roan, *Deepdale's Darling 2nd,* 1 y., 4 m.; s., Duke of Oxford 70th (51,141); d., Deepdale's Darling; s. of d., Rowfant Duke of Oxford (43,926).

HEREFORD.

CLASS 39.—*Bull calved in* 1884 *or* 1885. Seven entries.

First Prize, 20*l.*, R. KEENE, Pencraig, Caerleon, Monmouthshire, red with white face, *Three R's* (11,783), 3 y., 1 m., 2 d.; s., Bangham (6793); d., Jeffery 7th; s. of Lord Waterford (6045).

Second Prize, 10*l.*; T. FENN and W. TUDGE, Stonebrook House, Ludlow, red with white face, *Viscount Wilton* (11,824), 3 y., 10 m., 2 w.; bred by

the late T. Carwardine, Stocktonbury, Leominster; s., Lord Wilton (4740); d., Brenda; s. of d., Corsair (527).

Reserve, EARL OF COVENTRY, Croome Court, Severn Stoke, red with white face, *Clarion* (9710), 4 y., 2 w., 4 d.; s., Consul (7513); d., Claribel 2nd; s. of d., Fisherman (5913).

Highly Commended, EARL OF COVENTRY, red with white face, *Rondean* (11,622), 3 y., 3 m., 1 w., 4 d.; s., Minstrel (8915); d., Rhodia IV.; s. of d., Spartan (5009).

Commended, W. T. CRAWSHAY, Cyfarthfa Castle, Merthyr Tydfil, red with white face, *Stockton Prince*, 4 y., 1 m., 4 w., 1 d.; bred by T. J. Carwardine, Stocktonbury, Leominster; s., Lord Wilton (4740); d., Ruth; s. of d., Rodney (4907).

CLASS 40.—*Bull calved in* 1886. Seven entries.

First Prize, 20*l.*, and Champion Prize, 10*l.*,* for best bull in the Hereford Classes; J. PRICE, Court House, Pembridge, red with white face, *Prince Alfred* (12,534), 2 y., 1 m., 1 w., 4 d.; s., Monarch (7858); d., Playful; s. of d., Hotspur (7328).

Second Prize, 10*l.*; EARL OF COVENTRY, Croome Court, Severn Stoke, red with white face, *Golden Miner*, 2 y., 2 m., 2 w.; s., Californian (8355); d., Golden Dream; s. of d., Fisherman (5913).

Reserve and Highly Commended, J. TUDGE, Alton Court, Dilwyn, Herefordshire, red with white face, *Alton* (11,877), 1 y., 9 m., 4 w.; s., Leinthall (8801); d., Coral; s. of d., Marechal Niel (4760).

Commended, H. W. TAYLOR, Showle Court, Ledbury, red with white face, *Sarchedon* (12,656), 1 y., 9 m., 1 w., 3 d.; s., Maidstone (8875); d., Fairy; s. of d., Thoughtful (5063).

CLASS 41.—*Bull calved in* 1887. Seven entries.

First Prize, 15*l.*; A. E. HUGHES, Wintercott, Leominster, red with white face, *Royal Head*, 1 y., 4 m., 4 w.; s., Cheerful (6351); d., Beauty; s. of d., Garfield 2nd (7648).

Second Prize, 10*l.*; EARL OF COVENTRY, Croome Court, Severn Stoke, red with white face, *Royal Ruler*, 1 y., 2 m., 1 w., 2 d.; s., Rare Sovereign (10,499); d., Rosemary; s. of d., Grove 3rd (5351).

Reserve and Highly Commended, J. RANKIN, M.P., Bryngwyn, Tram Inn, R.S.O., red with white face, *Gaylad*, 1 y., 3 m., 2 d.; s., Mars (10,280); d., Gaylass; s. of d., Garnet (5929).

Highly Commended, H. F. RUSSELL, Westonbury, Pembridge, red with white face, *Sir William*, 1 y., 2 m., 3 w., 4 d.; s., Horace Hardwick (8748); d., Lady Nancy; s. of d., Horatius (5390).

CLASS 42.—*Cow, in-Milk or in-Calf, calved before* 1885. Ten entries.

First Prize, 15*l.*; J. W. HAYTER, Manor Farm, Stourton Caundle, Blandford, red with white face, *Brunette*, 4 y., 2 m., 2 w., 1 d.; bred by S. Goode, Montpelier House, Hereford; s., Remus (5535); d., Darkey 2nd; s. of d., Cremorne (5279).

Second Prize, 10*l.*; W. TUDGE, Leinthall, Ludlow, red with white face, *Bella*, 5 y., 4 m., 1 w., 6 d.; s., Auctioneer (5194); d., Belladonna; s. of d., Orleans (2661).

Reserve and Highly Commended, J. RANKIN, M.P., Bryngwyn, Tram Inn, R.S.O., red with white face, *Fortune-teller*, 4 y., 2 m., 2 w.; s., Pirate (6105) d., Gipsy; s. of d., The Grove 3rd (5051).

Commended, R. W. BRIDGWATER, Great Porthamal, Talgarth, *Blossom 6th*, 7 y., 9 m., 4 w., 2 d.; s., Romulus (5543); d., Blossom 2nd; s. of d., Glendowey 2nd (3840):—EARL OF COVENTRY, Croome Court, Severn Stoke,

* Given by the Newport Local Committee.

red with white face, *Silver Song*, 3 y., 5 m., 3 w., 3 d.; s., Minstrel (8915); d., Silver Cloud; s. of d., Fisherman (5913):—and W. T. CRAWSHAY, Cyfarthfa Castle, Merthyr Tydfil, red with white face, *Cyfarthfa Lady Frances*, 3 y., 5 m., 3 w., 6 d.; s., Downton Magnet (6912); d., Lady Frances 4th; s. of d., Avenger (5198).

CLASS 43.—*Heifer, in-Milk or in-Calf, calved in* 1885. Six entries.

First Prize, 15*l.*; H. W. TAYLOR, Showle Court, Ledbury, red with white face, *Cardiff Lass 2nd*, 3 y., 5 m., 1 d.; s., Franklin (6961); d., Cardiff Lass; s. of d., Emperor (5890).

Second Prize, 10*l.*; Colonel R. BRIDGFORD, C.B., Kinnersley, near Hereford, red and white, *Princess*, 3 y., 1 d.; s., Regulator (6637); d., Victoria 2nd; s. of d., Regulus (4076).

Reserve and Highly Commended, R. PALMER, Lodge Farm, Nazeing, Waltham Cross, red with white face, *Lightfoot*, 2 y., 11 m., 2 w.; s., Rosestock (6651); d., Lilian; s. of d., Rodney (4907).

Commended, W. TUDGE, Leinthall, Ludlow, red with white face, *Bluebell*, 3 y., 4 m., 19 d.; s., Auctioner (5194); d., Belladonna; s. of d., Orleans (2661).

CLASS 44.—*Heifer calved in* 1886. Five entries.

First Prize, 10*l.*, and Champion Prize, 10*l.*; * for the best Cow or Heifer in the Hereford Classes, EARL OF COVENTRY, Croome Court, Severn Stoke, red with white face, *Rosewater*, 2 y., 3 m., 1 w., 2 d.; s., Rare Sovereign (10,499); d., Rosemary; s. of d., Grove 3rd (5051).

Second Prize, 5*l.*, W. TUDGE, Leinthall, Ludlow, red with white face, *Lady Wilton*, 2 y., 5 m.; s., Lord Wilton (4740); d., Cherry Blossom; s. of d., Downton Boy (5877).

Reserve and Highly Commended, H. F. RUSSELL, Westonbury, Pembridge, red with white face, *Her Majesty*, 2 y., 3 m., 1 w., 5 d.; s., Horace Hardwick (8748); d., Uphampton Lass; s. of d., Prince (5511).

Commended, Sir J. L. E. SPEARMAN, Bart., Llansannor Court, Cowbridge, Glamorganshire, red with white face, *Orange Blossom*, 2 y., 1 m., 2 w., 1 d.; s., Torro (7313); d., Myrtle VI.; s. of d., Ambassador (4551):—and J. H. ARKWRIGHT, Hampton Court, Leominster, red with white face, *Ivington Lass 24th*, 2 y., 5 m., 5 d.; s., Rose Cross (7237); d., Ivington Lass 5th; s., of d., Concord (4458).

The Class Commended.

CLASS 45.—*Heifer, calved in* 1887. Sixteen entries.

First Prize, 10*l.*, R. GREEN, The Whitherne, Kington, Herefordshire, red and white, *Jenny Lind*, 1 y., 4 m.; s., Whittern Grove (10,843); d., Ivington Lass 9th; s. of d., Mareschal Niel (4760).

Second Prize, 5*l.*; A. E. HUGHES, Wintercott, Leominster, red with white face, *Princess*, 1 y., 3 m., 2 w., 1 d.; s., Cheerful (6351); d., Newton Plum; s. of d., Rudolph (6660).

Third Prize (Specially Recommended), R. KEENE, Pencraig, Caerleon, Monmouthshire, red with white face, *Blanche Bangham*, 1 y., 4 m., 4 w., d.; s., Bangham (6793); d., Blanche 2nd; s. of d., Return (6639).

Reserved and Highly Commended, J. VAUGHAN, Downfield Farm, Old Radnor, Radnorshire, red with white face, *Lady 9th*, 1 y., 5 m., 1 d.; s., Prince Imperial (5518); d., Lady 4th; s. of d., Flower (5428).

Highly Commended, R. KEENE, red with white face, *Belle Bangham*, y., 3 m., 4 w., 1 d.; s., Bangham (6793), d., Lady Chancellor; s. of d., Chancellor (6855):—and Col. R. BRIDGFORD, C.B., Kinnersley, near Hereford,

* Given by the Newport Local Committee.

red and white, *Norah*, 1 y., 4 m., 4 w., 1 d.; s., Torro (7313); d., Bonnymaid; s. of d., The Knight (6222).

Commended, Colonel R. BRIDGFORD, C.B., red and white, *Valentine*, 1 y., 5 m., 4 d.; s., Torro (7313); d., Viola; s. of d., The Knight (622):—and R. J. PENHALL, Weston House, Pembridge, red with white face, *Crystal*, 1 y., 4 m., 3 w., 5 d.; s., General Gordon (8650); d., Clochette; s. of d., Grateful 2nd (5951).

SUSSEX.

CLASS 46.—*Bull calved in* 1884 *or* 1885. Six entries.

First Prize, 20*l.*; W. S. FORSTER, Gore Court, Maidstone, red, *Mikado* (705), 4 y., 4 m., 3 w., 1 d.; bred by A. Holmes, Udimore, Sussex; s., Steyning (729); d., Lily.

Second Prize, 10*l.*; W. WOOD and SON, Hassocks, Sussex, red, *Oxford 2nd* (771), 3 y., 5 m., 3 w., 4 d.; bred by J. S. Oxley, Fenn Place, Worth; s., Oxford 1st (513); d., Lady Ham (2876); s. of d., Lord Bath (281).

Reserve and Highly Commended, Sir F. MONTEFIORE, Bart., Worth Park, Crawley, *Gold-dust 9th* (675), 3 y., 3 m., 3 w.; bred by A. Stanford, Ashurst, Steyning; s., Goldsmith (391); d., Hardy 3rd (2237).

CLASS 47.—*Bull calved in* 1886. Two entries.

First Prize, 20*l.*; W. B. WATERLOW, High Trees, Redhill, Surrey, red, *Gentleman* (814); 1 y., 10 m., 3 w., 4 d.; bred by E. and A. Stanford, Steyning; s., Goldsmith (391); d., Gentle Lady (2607); s. of d., Son of Dorchester (521).

Second Prize, 10*l.*, not awarded.

CLASS 48.—*Bull calved in* 1887. Eight entries.

First Prize, 15*l.*; J. S. HODGSON, Lythe Hill, Haslemere, Surrey, red, 1 y., 1 m., 1 d.; s., King Rufus (758); d., Laura 3rd (2055); s. of d., Little Tom.

Second Prize, 10*l.*; A. HEASMAN, Court Wick, Littlehampton, red, *Goldfinder* (821), 11 m.; bred by E. and A. Stanford, Steyning; s., Goldsmith (391); d., Dewberry (2217); s. of d., Bedford (316).

Reserve and Highly Commended, W. S. FORSTER, Gore Court, Maidstone, red, *Nero*, 11 m., 1 w., 3 d.; s., Mikado (705); d., Splendour (2145); s. of d., Robinson Crusoe (267).

Commended, J. GODMAN, Park Hatch, Godalming, red, *Oxford Duke 1st* (840), 1 y., 3 m., 3 w., 6 d.; s., Oxford Duke (708); d., Noble Lady (2911); s. of d., Napoleon 3rd (396).

CLASS 49.—*Cow, in-Milk or in-Calf, calved before* 1885. Three entries.

First Prize, 15*l.*; W. B. WATERLOW, High Trees, Redhill, Surrey, red, *Elsa* (3214), 4 y., 1 m., 1 w., 1 d.; s., Wallace (478); d., Norma (2272); s. of d., The Czar (312).

Second Prize, 10*l.*; J. S. HODGSON, Lythe Hill, Haslemere, Surrey, red, *Laura 7th* (3268), 4 y., 6 m.; s., Lord Oxford (461); d., Laura 3rd (2055); s. of d., Little Tom.

Reserve, L. HUTH, Waldron, Sussex, red, *Lilly 2nd* (2882), 8 y., 1 m., 3 w.; s., Sir Roger 1st; d., Lilly (2636); s. of d., Reeves.

CLASS 50.—*Heifer, in-Milk or in-Calf, calved in* 1885. Four entries.

First Prize, 15*l.*; J. S. HODGSON, Lythe Hill, Haslemere, Surrey, red, *Laura 8th* (3499), 3 y., 4 m., 3 w.; s., Prince Alfred (555); d., Laura 3rd (2055); s. of d., Little Tom.

Second Prize, 10*l.*; BARCLAY FIELD, 26, Hill Street, Berkeley Square, London, red, *Birdseye* (3908), 2 y., 6 m., 3 w., 5 d.; bred by G. White, Hunton, Kent; s., Udimore; d., Nelly (2097).

Reserve, J. GODMAN, Park Hatch, Godalming, Surrey, red, *Noble Lady 2nd* (3541), 3 y., 4 m., 1 w., 3 d.; s., Goldboy (541); d., Noble Lady (2911); s. of d., Napoleon 3rd (396).

CLASS 51.—*Heifer calved in* 1886. Six entries.

First Prize, 10*l.*; W. S. FORSTER, Gore Court, Maidstone, red, *Parade* (4106), 2 y., 1 m., 2 w.; s., Mikado (705); d., Splendour (2145); s. of d., Robinson Crusoe (267).

Second Prize, 5*l.*; J. GODMAN, Park Hatch, Godalming, Surrey, red, *Comely 9th* (3682), 2 y., 4 m., 3 w.; s., Goldboy (541); d., Cherry (2558); s. of d., Napoleon 3rd (396).

Reserve and Highly Commended, J. S. HODGSON, Lythe Hill, Haslemere, Surrey, red, *Young Emily 2nd* (3865), 1 y., 11 m., 3 w.; s., Frankfort (671); d., Young Emily (2737); s. of d., Oxford (304).

Commended, BARCLAY FIELD, 26, Hill Street, Berkeley Square, London, red, *Beatrice*, 2 y., 4 m., 2w., 1 d.; s., Udimore; d., Bustin (3404).

CLASS 52.—*Heifer, calved in* 1887. Ten entries.

First Prize, 10*l.*; BARCLAY FIELD, 26, Hill Street, Berkeley Square, London, red, *Primrose*, 1 y., 4 m., 2 w., 2 d.; s. Gold-dust 2nd (593); d., Hardy 10th (3048); s. of d., Young Hartley.

Second Prize, 5*l.*; J. S. HODGSON, Lythe Hill, Haslemere, Surrey, red, *Pride of the Family 7th* (4119), 1 y., 2 m.; s., Prince Rufus (515); d., Pride of the Family 2nd (2469); s. of d., Young Hartley.

Reserve and Highly Commended, J. GODMAN, Park Hatch, Godalming, red, *Gentle 8th* (4002), 1 y., 3 m., 1 w., 4 d.; s., Nobleman (707); d., Gentle 4th (2601); s. of d., Tavistock (370).

The Class Commended.

JERSEY.

CLASS 53.—*Bull calved in* 1884 *or* 1885. Seven entries.

First Prize, 15*l.*; J. BRUTTON, 7, Princes Street, Yeovil, whole colour, *Dog Fox* (Suppl. 86, L.J.), 4 y., 1 m., 5 d.; bred by J. Cardus, Town Hill, Southampton; s., Baron Lionel (994); d., Vixen (Vol. 3384); s. of d., Dairy King (211).

Second Prize, 10*l.*; LORD ASHBURTON, The Grange, Alresford, Hants, steel grey, black points, *Baron de Rullecourt* (late Laddy), 3 y., 1 m., 2 w., 1 d.; bred by P. Godeaux, Trinity, Jersey; s., Baron de Rullecourt M.; d., Jolie Grisette (J.H.B. 6698).

Third Prize, 5*l.*; Mrs. J. BROGDEN, Porthcawl, fawn, *Secret*, 2 y., 11 m., 2 w., 2 d.; bred by J. A. Desreaux, Perry Farm, St. Mary's, Jersey; s., Queenie's Boy R.T.; d., Sweet Secret.

Reserve, LORD ASHBURTON, steel grey, black points, *Martin St. Peter's*, 3 y., 8 m., 1 w., 5 d.; bred by P. Le Masurier, St. Peter's, Jersey; s., King of St. Peter's (413 H.C. in J.H.B.); d., Purple Queen (6110 F.S., J.H.B.).

Commended, THE MACKINTOSH OF MACKINTOSH, Cottrell House, near Cardiff, dark forequarter and fawn body, *Dick*, 3 y., 1 w.; s., Welldone; d., Lady Nelly.

CLASS 54.—*Bull, calved in* 1886. Twelve entries.

First Prize, 15*l.*; J. R. CORBETT, More Place, Betchworth, Surrey, dark grey, *Franciscan*, 1 y., 9 m., 4 d.; bred by J. Arthur, St. Mary's, Jersey; s., Royal Khedive (628 J.H.B.); d., Golden Crown (6524); s. of d., Tusquanum (262).

Second Prize, 10*l.*; EARL OF LONDESBOROUGH, Northerwood, Lyndhurst, Hants, dark grey, *Marius*, 2 y., 3 m., 2 w., 5 d.; s., Rainbow (1943 E.J.H.B.); d., Maria III. (vol. iii., p. 277, E.J.H.B.).

Third Prize, 5*l.*; W. D. TUCKER, 74, High Street, Southampton, fawn, *Golden King* (955 H.C.P.S.), 2 y., 2 m., 2 w.; bred by F. Le Brocq, St. Owen's, Jersey; s., Wolseley (H.C. 401 P.S); d., Miss Prudence (1108 P.S.).

Reserve and Highly Commended, Miss M. PEEL, Batchworth Heath, Rickmansworth, Hertfordshire, grey fawn, *Royal Blue 2nd*, 1 y., 9 m.; bred by S. H. Hyde, Kempton Park, Sunbury-on-Thames; s., Royal Blue (F.S.); d., Sweet Lady.

Highly Commended, Mrs. A. F. PERKINS, Oakdene, Holmwood, Surrey, silver grey, *Baron Wolseley*, 1 y., 11 m., 4 w.,; bred by J. H. Orange, St. Brelade's, Jersey; s., Lord Wolseley (631 J.H.B.); d., Dido 3rd; s. of d., Wolsey (401 J.H.B.).

Commended, W. E. BUDGETT, Stoke House, Stoke Bishop, Bristol, whole dark brown, *Little Welcome*, 2 y., 5 m.; s., Welcome (366); d., Elfine II. (p. 1018, J.H.B.); s. of d., Beaconsfield (p. 333, H.C.):—E. TRINDER, Perrott's Brook, Cirencester, silver grey, *Khedive's Legacy*, 1 y., 8 m., 3 w., 3 d.; bred by A. Le Gallais, La Merrye, Jersey; s., Royal Khedive (F.W.); d., Mab 3rd; s. of d., Silver King (2030):—and Hon. Mrs. C. HOWARD, Dutchlands, Great Missenden, Buckinghamshire, whole grey, *Les Morais*, 1 y., 9 m.; bred by Madame Mourant, Grouville, Jersey; s., Isleworth; d., Daisy of Bolivot.

CLASS 55.—*Bull calved in* 1887. Sixteen entries.

First Prize, 15*l.*; G. SIMPSON, Wray Park, Reigate, Surrey, fawn, *Bessie's Boy*, 1 y., 1 m., 2 w., 1 d.; s., Wolseley's Glory (2168), d., Bessie (vol. iii., p. 149); s. of d., Noble 2nd (1172).

Second Prize, 7*l.*; G. SIMPSON, grey, *Monopolist*, 1 y., 1 m., 2 w., 3 d.; s., Farmer's Joy (1075), d. Mentone (vol. iii., E.J.H.B., p. 235), s. of d., Orpheus (1178).

Third Prize, 3*l.*; E. P. FOWLER, Gloucester Square, Southampton, solid grey, *Denlzia's Duke* (1004 J.H.B.), 1 y., 4 m.; bred by Priault, Jersey; s., Duke of Sherwell (669 J.H.B.); d., Denlzia (2956; J.H.B.)

Reserve, W. E. BUDGETT, Stoke House, Stoke Bishop, Bristol, fawn, *Frisky*, 1 y., 2 d.; s., Lemon Peel's Glory; d., Fair Maid; s. of d., Rover (1978).

Highly Commended, H. J. CORNISH, Thornford, Sherborne, Dorset, silver grey, *Leonora's Laddie*, 1 y., 1 m., 3 d.; s., Kaiser; d., Leonora; s., of d., Franklin.

Commended, H. J. CORNISH, dark grey, *Dairy King 2nd.*, 1 y., 4 d.; s., Dairy King (211 E.H.B.); d., Lady of the Isles 3rd (vol. iii, E.H.B., p. 255); s. of d., Grey of the West (1098 E.H.B.):—E. TRINDER, Perrott's Brook, Cirencester, silver grey, *Gandy*, 1 y., 4 m., 1 w., 3 d.; s., Moscow (1839); d., Gloriosa; s. of d., Farmer's Glory (319):—E. TRINDER's silver grey, *Marquis*, 10 m., 2 w., 5 d.; s., La Davipimarius Duke (C.X.); d., Milkmaid 11th; s. of d., Farmer's Joy (1075):—and Mrs. M. J. CROOKES, Heathfield, Letterston, R.S.O., Pembrokeshire, mulberry, *Blackmail*, 7 m. 3 w.; s., Snider (723 H.C.J.H.B.); d., Black Bess 2nd (1740 P.S., J.H.B.); s. of d., Perrot (342 P.S., J.H.B.).

CLASS 56.—*Cow, in-Milk or in-Calf, calved before* 1885. E. 21.

First Prize, 15*l.*; G. SIMPSON, Wray Park, Reigate, Surrey, yellow fawn, *Rosy 3rd*, 4 y., 4 m., 1 w., 4 d.; bred by W. Alexander, jun., St. Mary's Jersey; s., Wolseley (2165); d., Rosy (512 P.S., J.H.B.); s. of d., Carlo (180, P.S., J.H.B.).

Second Prize, 10*l.*; G. SIMPSON, grey fawn, *Bessie* (vol. iii. p., 149), 9 y., 3 w., 4 d.; bred by P. Mourant, Jersey; s., Noble 2nd (1172); d., Beauty (J.H.B., vol. i., 637, F.S.C.).

Third Prize, 3*l.*; W. E. BUDGETT, Stoke House, Stoke Bishop, Bristol,

silver grey, *Prima Donna*, 5 y., 4 m., 1 d.; bred by J. de L. Montais, St. Brelade's Jersey; s., General Don; d., Gertie (3053).

Reserve and Very Highly Commended, W. E. BUDGETT, dark brown, *Black Bess* (F. 3749 H.C.J.H.B.), 8 y.; bred by J. Arthur, St. Mary's, Jersey.

Very Highly Commended, Hon. Mrs. C. HOWARD, Dutchlands, Great Missenden, Buckinghamshire, whole grey, *Hips*, 3 y., 9 m.; s., Hope (1690 E.J.H.B.); d., Holly (vol. iii., p. 231, E.J.H.B.).

Highly Commended, Mrs. A. HOPWOOD, Ketton Hall, Stamford, fawn, *Geranium*, 4 y., 3 m., 1 w., 4 d.; bred by Mr. F. Bircham, Burhill; s., Fuchsia (1601); d., Miriam; s. of d., Gipsy Lad (359):—and W. ADAMS, Staniforth, Tuffley, Gloucester, dark fawn, *Pretty Maid*, 6 y., 3 m., 1 w., 4 d.; bred by Firmingen, Trinity, Jersey; s., Cicero (266 J.H.B.); d. Rosa (299 J.H.B.); s. of d., Rock (130 J.H.B.).

Commended, H. J. CORNISH, Thornford, Sherborne, Dorset, fawn, *Sultan 10th*, 3 y., 10 m., 3 w., 4 d.; bred by J. P. Marett, St. Saviour's, Jersey; s., Count Cicero (398 J.H.B.); d., Sultan 8th; s. of d., Farmers' Joy:—EARL OF LONDESBOROUGH, Northerwood, Lyndhurst, Hants, brown, *Les Prairie Flandrine*, 5 y., 2 m., 1 w., 1 d.; bred by P. W. Picot, St. John's, Jersey; s., Golden Cloud (1632 E.J.H.B.); d., Zinnia (4519, J.H.B.); s. of d., Neptune (14, J.H.B.):—EARL OF LONDESBOROUGH'S dark fawn, *Precoce II.*, 5 y., 3 m., 2 w., 3 d.; bred by T. Mourant, Trinity, Jersey; s., Colonel Hardy (331 J.H.B.); d. Precoce (3442 J.H.B.):—Hon. Mrs. C. HOWARD, whole fawn, *Mignonne* (vol. iii., E.J.H.B.), 8 y., 10 m.; bred by L. Best; s., Mignon (1157); d., Emmeline:—and J. H. ORANGE, St. Brelade's, Jersey, creamy fawn, *Eva's Gazelle*, 5 y., 6 m., 2 w., 5 d.; bred by J. J. Le Gros, St. Helier's, Jersey; s., St. John (316); d., Eva (607 P.S.); s. of d., Mobilier (293).

CLASS 57.—*Heifer, in-Milk or in-Calf, calved in* 1885. Ten entries.

First Prize 15*l.* and Gold Medal,* J. R. CORBETT, More Place, Betchworth, Surrey, *Stargazer 4th*, 3 y., 1 m., 1 w., 5 d.; s., Baron Betchworth; d., Stargazer 2nd; s. of d., Romeo.

Second Prize, 7*l.*, EARL OF LONDESBOROUGH, Northerwood, Lyndhurst, Hampshire, grey fawn, *Governess*, 3 y., 5 m., 4 d.; s., Rainbow (vol. iii., 1943); d., Dame Luzeraine (vol. iii., p. 191).

Third Prize, 3*l.*, Captain P. LE BROCQ, Broughton Lodge, St. Mary's, Jersey, dark fawn, *Rosanna 2nd* (1630 J.H.B.), 3 y., 3 m., 3 w., 4 d.; bred by A. Grandeir, St. Martin's, Jersey; s., Conquest (354 J.H.B.); d., Rosanna (1979 J.H.B.).

Reserve and Highly Commended, Captain LE BROCQ, dark fawn, *Clara of Highlands*, 2 y., 5 m., 3 w.; bred by T. Blampied, St. Peter's, Jersey; s., Pretender (454 J.H.B.); d., Edesia (6194 J.H.B.).

Commended, Mrs. J. BROGDEN, Porthcawl, grey, *Birdie*, 2 y., 7 m., 1 w., 2 d.; s., Bumble Bee (1403); d., Butterstar (Sup. 1884, p. 10, E.J.H.B); s. of d., Stonehenge (2078):—and LORD POLTIMORE, Poltimore Park, Exeter, fawn, *Violet*, 3 y., 2 m., 2 w.; s., Baron Cicero (1332); d., Heartease (vol. iii., 224); s. of d., Hero (1679).

CLASS 58.—*Heifer calved in* 1886. Twenty-seven entries.

First Prize, 7*l.*; H. J. CORNISH, Thornford, Sherborne, Dorsetshire, *Try 2nd*, 2 y., 4 m.; bred by H. J. Longlois, St. John's, Jersey; s., Wolseley (401 J.H.B.); d., Try (103 J.H.B.).

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* Special Prize given by the English Jersey Cattle Society for the best Cow or Heifer, in-milk, in the Jersey Classes, bred in Great Britain or Ireland, and eligible for the English Jersey Cattle Society's Herd Book, that has not (except for the Butter test) already been awarded the Society's Gold Medal.

Second Prize, 5*l.*; H. J. CORNISH, fawn, *Madeira 3rd*, 2 y., 3 m., 2 w., 5 d.; bred by E. Renouf, St. Brelade's, Jersey; s., Wolseley (401 J.H.B.); d., Madeira (2090 J.H.B.).

Third Prize, 3*l.*; E. P. FOWLER, Gloucester Square, Scuthampton, fawn, *Carlo's Leeta 2nd*, 2 y., 5 m.; bred by — Neel, Jersey; s., Josephus (388 J.H.B.); d., Carlo's Leeta 1st (5144).

Reserve and Very Highly Commended, G. SIMPSON, Wray Park, Reigate, Surrey, fawn, *Pandora 11th*, 2 y., 3 w., 4 d.; s., Wolesley's Glory (2168 E.J.H.B.); d., Pandora 5th (vol. iii., p. 305, E.J.H.B.); s. of d., Nimrod (1171 E.J.H.B.).

Very Highly Commended, E. P. FOWLER, grey, *Test Me 2nd*, 1 y., 14 m.; bred by — Perree, Jersey; s., Lily's Prince (681 J.H.B.); d., Test Me (7118 J.H.B.).

Highly Commended, H. J. CORNISH, dark fawn, *St. Martin's Daisy*, 2 y., 2 m., 2 w., 3 d.; bred by R. G. Baal, St. Martin's, Jersey; s., Golden Chief (513 J.H.B.); d., Bergae :—E. P. FOWLER, grey, *Queen of Saumarez 2nd*, 2 y., 4 m.; bred by Le Jeune, Jersey; s., Respectable Lad (672 J.H.B.); d., Queen of Saumarez (2914 J.H.B.) :—J. H. ORANGE, St. Brelade's, Jersey dark grey, *Robine*, 1 y., 11 m., 3 w.; bred by J. Le Moignan, St. John's, Jersey; s., King Victor (416): d. Mourier Pail (6221) :—and Captain P. Le Brocq, Broughton Lodge, St. Mary's, Jersey, fawn, *Somerset 3rd*, 2 y., 2 m., 2 d.; bred by J. Contanche, St. Lawrence, Jersey; s., Baron de Rullecourt (556 J.H.B.); d., Somerset (3735 J.H.B.).

Commended, W. D. TUCKER, 74, High Street, Southampton, fawn grey, *Preference Queen*, 2 y., 3 m., 1 w.; bred by J. B. Badier, St. Martin's, Jersey; s., Emperor 3rd (635); d., Argentine (4266) :—W. D. Tucker, fawn grey, *Preference Princess*, 2 y., 3 m., 3 w.; bred by J. B. Badier, St. Martin's, Jersey; s., Emperor 3rd (635); d., Faithful (2664) :—and J. H. ORANGE, St. Brelade's, Jersey, silver grey, *Camilla 4th*, 2 y., 1 m., 1 w., 2 d.; bred by J. Arthur, St. Mary's, Jersey; s., Snider (723); d., Camilla (224 P.S.).

CLASS 59.—*Heifer, calved in* 1887. **Twenty-nine entries.**

First Prize, 7*l.*; Mrs. M. J. CROOKES, Heathfield, Letterston, R.S.O., Pembrokeshire, dark grey, *Selection*, 1 y., 1 w., 2 d.; s., Bluecoat Boy (J. F., Sup. 86, E.J.H.B.); d., St. Martin's Choice (Sup. 85, p. 26, E.J.H.B.); s. of d., Earl St. Martin's (1549, vol. 3, E.J.H.B.).

Second Prize, 5*l.*; G. SIMPSON, Wray Park, Reigate, Surrey, fawn, *Lady Godiva*, 10 m., 4 w.; s., Zerebat U. G.; d., Lady Georgina; s. of d., Nero du Ccin (1849 E.J.H.B.).

Third Prize, 3*l.*; Mrs. A. F. PERKINS, Oakdene, Holmwood, Surrey, light fawn, *Lady Prim*, 1 y., 4 m., 2 w., 5 d.; s., Lord of Carolina; d., Longueville Pride; s. of d., Cossack.

Reserve, J. R. CORBETT, More Place, Betchworth, Surrey, light fawn, *Emily E.*, 1 y., 1 m., 3 w., 3 d.; s., Nestor's Prince; d., Emily 8th; s. of d., Baron Betchworth.

Highly Commended, Mrs. M. CUSTANCE, Brook Heath, Breamore, Salisbury, grey, *Syren's Pride*, 6 m., 6 d.; s., General Gordon (E.J.H.B. 1620), d., Syren (E.J.H.B., sup. 85, p. 27); s. of d., Lord Chichester (E.J.H.B. 1142) :—W. E. BUDGETT, Stoke House, Stoke Bishop, Bristol, fawn, *Lucy IV.*, 9 m., 3 w., 1 d.; s., Welcome's Pride U.A.; d., Lucy II. :—and Miss M. PEEL, Batchworth Heath, Rickmansworth, Herts, grey, *Her Majesty*, 1 y., 3 w., 2 d.; bred by late Mrs. Malcolm, Beechwood, Lyndhurst; s., Wolseley's Champion (H.P.); d., Minnie; s. of d., Lord Chichester (1142).

Commended, H. J. CORNISH, Thornford, Sherborne, Dorset, silver grey, *Bragga's Daisy*, 1 y., 6 d.; bred by L. Le Vaufre, Grouville, Jersey; s., Bragga Boy (783 P.S., J.H.B.); d., Lady Grouville (2208 P.S., J.H.B.); s. of d., Dauntless (403 J.H.B.) :—W. E. BUDGETT, whole fawn, *Sweet Briar IV.*,

1 y., 1 m., 2 w., 6 d.; s., Welcome's Pride U.A.; d., Sweet Briar II.:—E. TRINDER, Perrott's Brook, Cirencester, fawn, *Sapphire*, 1 y., 2 m.; s., Moscow (1839); d., Strawberry 2nd; s. of d. Ruby (J.H.B. 371):—J. BRUTTON, 7, Prince's Street, Yeovil, fawn, *Lioness*, 1 y., 3 m., 1 w., 2 d.; s., Lion (1758); d., Lady Digby; s. of d., Lord Digby's Bull:—and Mrs. J. BROGDEN, Porthcawl, grey fawn, *Wild Clematis*, 8 m., 3 w., 4 d.; s., Butterbring J.U.; d., Clematis.

GUERNSEY.

CLASS 60.—*Bull, calved in* 1884 *or* 1885. Four entries.

First Prize, 15*l.*, and Silver Medal;* W. A. GLYNN, Seagrove, Seaview, Isle of Wight, orange fawn and white, *Hopeful* (25 E.G.H.B.), 4 y., 2 w., 6 d.

Second Prize, 5*l.*; Sir F. MONTEFIORE, Bart., Worth Park, Crawley, Sussex, fawn and white, *Sir Francis* (155 E.G.H.B.), 3 y., 6 m., 2 w.; bred by N. Robin, Guernsey; s., Climax (48 P.S., R.G.A.S.); d., Fair Lass (562 R.G.A.S.).

Reserve and Highly Commended, EXPRESS DAIRY COMPANY (Limited), College Farm, Finchley, Middlesex, lemon, fawn and white, *Sterling* (157 E.G.H.B.), 3 y., 8 m., 3 w.; bred by D. Bichard, Vale, Guernsey; s., Climax (14 E.G.H.B.); d., Flossy (309 R.G.A.S.).

CLASS 61.—*Bull, calved in* 1886. Six entries.

First Prize, 15*l.*; H. S. MORRIS, Pear Tree House, Bitterne, Southampton, red and white, *Norman* (E.G.H.B.), 1 y., 9 m., 6 d.; bred by F. Carey, The Cottage, Costel, Guernsey; s., Volage (98 P.S.); d., Trophy (181 P.S.)

Second Prize, 5*l.*; Sir F. MONTEFIORE, Bart., Worth Park, Crawley, fawn and white, *Valentine*, 2 y., 4 m.; bred by J. De Garis, Guernsey; s., May Boy (176 P.S.); d., Nonpareille (237).

Reserve and Very Highly Commended, W. D. TUCKER, 74, High Street, Southampton, orange, *Marc Anthony*, 2 y., 2 m., 3 w., 4 d.; bred by J. Le Page, Villicq, Guernsey; s., Royal 2nd (110 P.S.); d. Fanny of the Villicq (498 P.S.)

CLASS 62.—*Bull, calved in* 1887. Eight entries.

First Prize, 10*l.*; H. S. MORRIS, Pear Tree House, Bitterne, Southampton, fawn and white, *Constantine* (E.G.H.B.), 1 y., 3 w., 1 d.; bred by Major H. L. Green, St. Martin's, Guernsey; s., Master Tom (170 P.S.); d., Constance 2nd (166 P.S.)

Second Prize, 5*l.*; W. A. GLYNN, Seagrove, Seaview, Isle of Wight, orange fawn and white, *Surprise*, 11 m., 1 w., 2 d.

Reserve and Very Highly Commended, H. S. MORRIS, fawn and white, *Humphry* (E.G.H.B.), 1 y., 3 w., 1 d.; bred by Major H. L. Green, St. Martin's, Guernsey; s., Master Tom (170 P.S.); d., Constance 2nd (166 P.S.).

Commended, Hon. Mrs. A. BAILLIE-HAMILTON, Combs, Stowmarket, fawn and white, *Royalty*, 1 y., 4 m., 2 w., 3 d.; s., Loyal (37 E.G.H.B.); d., Buttercup 1st (34 E.G.H.B.)

CLASS 63.—*Cow, in-Milk or in-Calf, calved before* 1885. E. 7.

First Prize, 15*l.*; H. S. MORRIS, Pear Tree House, Bitterne, Southampton, fawn and white, *Flowey II.* (E.G.H.B.), 6 y., 10 m., 6 d.; bred by C. Smith, St. Martin's, Guernsey; s., Squire of Les Vauxbelets (69); d., Flowey.

Second Prize, 5*l.*, and Silver Medal;* H. S. MORRIS, fawn and white, *Blossom* (21 E.G.H.B.), 7 y., 11 m.; bred by W. A. Glynn, Seagrove, Isle of Wight; s., Billy; d., Gentle.

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* Special Prize given by the English Guernsey Agricultural Society for the best Bull, Cow and Heifer, in the Guernsey Classes, bred in England, and eligible for the English Guernsey Cattle Society's Herd Book.

Reserve and Highly Commended, E. HANCOCK, Druid Stoke Farm, near Bristol, lemon fawn and white, *Minnie Palmer*, 5 y., 5 m., 4 w., 2 d.; bred by Col. W. M. Jones, La Marcherie, St. Martin's; s., Rival of La Pongre (211); d., Linda (1062).

Commended, EXPRESS DAIRY COMPANY (Limited), College Farm, Finchley, Middlesex, fawn, *Miranda III.*

CLASS 64.—*Heifer, in-Milk or in-Calf, calved in* 1885. Nine entries.

First Prize, 15*l.*; H. S. MORRIS, Pear Tree House, Bitterne, Southampton, fawn and white, *Rose Myra* (E.G.H.B.), 2 y., 5 m., 2 w.; bred by T. G. Browning, St. Andrew's, Guernsey; s., Lord John; d., Red Rose.

Second Prize, 5*l.*; Sir F. MONTEFIORE, Bart., Worth Park, Crawley, Sussex, fawn and white, *Grandeur 2nd* (1985 G.H.B.), 2 y., 1 m.; bred by J. De Garis, Guernsey; s., Royaliste; d., Grandeur 1st.

Reserve and Very Highly Commended, E. P. FOWLER, Gloucester Square, Southampton, self colour, *Cona* (1857 R.G.H.B.), 2 y., 10 m.; s., Volage (98, R.G.H.B.); d., Gloriana (789 R.G.H.B.)

Highly Commended, H. S. MORRIS, fawn and white, *Black Maid 3rd* (E.G.H.B.), 2 y., 11 m., 6 d.; bred by Mrs. J. Hindley, Villocq, Castel, Guernsey; s., Malcolm (139 P.S.); d., Black Maid (1178).

Commended, EXPRESS DAIRY Co. (Limited), College Farm, Finchley, lemon fawn and white, *Bonny Belle* (2046 G.H.B.), 3 y., 4 m., 2 w.; s., Cromwell; d., Primrose de St. Martin.

CLASS 65.—*Heifer calved in* 1886. Twelve entries.

First Prize, 10*l.*; and Silver Medal,* H. S. MORRIS, Pear Tree House, Bitterne, Southampton, fawn and white, *Frederica 4th* (558 E.G.H.B.), 2 y., 1 m., 2 w., 1 d.; s., Welcome (198 R.G.A.S.); d., Frederica 3rd (1557 E.G.H.B.).

Second Prize, 5*l.*; Colonel A. C. MACLEAY, Glasshayes, Lyndhurst, Hampshire, red and white, *Francisca*, 2 y., 1 m., 2 w., 6 d.; s., Pepin (49 E.G.H.B.); d., Fanny (108 E.G.H.B.).

Reserve and Very Highly Commended, EXPRESS DAIRY Co. (Limited), College Farm, Finchley, lemon fawn and white, *Constantia* (1926, P.S., R.G.A.S.), 2 y., 4 m., 1 w.; bred by T. Le Patourel, St. Martin's, Guernsey; s., Ajax (208 P.S., R.G.A.S.): d., Black Watch (1319 R.G.A.S.).

Highly Commended, G. LONG, Ogbourne St. Andrew, Marlborough, fawn and white, *Queen of the Roses 1st*, 2 y., 2 m., 2 w., 3 d.; s. Lofty (224 R.G.A.S.); d., Topsy du Rosewood (1696 G.H.B.); s. of d., Roger 5th (P.S., R.G.A.S.).

Commended, W. A. GLYNN, Seagrove, Seaview, Isle of Wight, lemon fawn and white, *Favourite 7th*, 1 y., 11 m.; s., Champion (11 E.G.H.B.); d., Favourite 4th (111 E.G.H.B.); s. of d., Billy 4th:—and Colonel A. C. MACLEAY, red and white, *Constantia* (730 E.G.H.B.—1319 P.S., R.G.A.S.), 2 y., 2 w., 1 d.; bred by Major H. L. Green, Ville Amphrey, Guernsey; s., Master Tom (170 P.S., R.G.A.S.); d., Constance 2nd (166 P.S., R.G.A.S.).

CLASS 66.—*Heifer, calved in* 1887. Seventeen entries.

First Prize, 10*l.*; G. LONG, Ogbourne St. Andrew, Marlborough, fawn and white, *Colonia 1st*, 1 y., 2 m., 3 w., 5 d.; s., Cloth of Gold 17th (87 E.G.H.B.); d., Colonia (338 E.G.H.B.); s. of d., Turk (165 R.G.A.S.).

Second Prize, 5*l.*; Hon. Mrs. A. BAILLIE-HAMILTON, Combs, Stowmarket, pale fawn and white, *Florence 3rd*, 1 y., 4 m., 2 w.; s., Loyal (37 E.G.H.B.); d., Florence (119 E.G.H.B.).

Reserve and Very Highly Commended, H. S. MORRIS, Pear Tree House, Bitterne, Southampton, fawn and white, *Sundew* (late Daisy Maud 6th,

* Special Prize given by the English Guernsey Agricultural Society for the best Bull, Cow and Heifer, in the Guernsey Classes, bred in England, and eligible for the English Guernsey Cattle Society's Herd Book.

E.G.H.B.), 1 y., 2 m., 3 w., 6 d.; bred by C. Browning, St. Andrew's, Guernsey; s., Wild Duke 2nd (262 P.S.); d., Daisy Maud (1446 F.S.).

Highly Commended, H. S. MORRIS, fawn and white, *Lady Alene 2nd* (E.G.H.B.), 11 m., 3 w., 5 d.; bred by A. W. Woodland, Jun., St. Martin's, Guernsey; s., Highlander (355 P.S.); d., Lady Alene (1321 P.S.).

Commended, W. A. GLYNN, Seagrove, Seaview, Isle of Wight, lemon fawn and white, *Wonda*, 10 m., 1 w., 3 d.; s., Hopeful (25 E.G.H.B.); d., Jessie (164 E.G.H.B.); s. of d., Billy 4th (7 E.G.H.B.):—and Sir F. MONTEFIORE, Bart., Worth Park, Crawley, fawn and white, *Little Duchess 6th*, 10 m.; s., Sir Francis (155); d., Little Duchess 5th; s. of d., Lord Strathallan (29 P.S., R.G.A.S.).

BLACK WELSH.

CLASS 67.—*Bull calved in* 1883, 1884 *or* 1885. Two entries.

First Prize, 10*l.*; W. E. OAKELEY, The Plas, Jan-y-Bwlch, Merionethshire, North Wales, *Harlech* (96), 4 y., 3 d.; bred by Lord Harlech, Glyn Hall, Talsarnam; s., Zulu (138); d., Gypsy.

Second Prize, 5*l.*; Not awarded.

CLASS 68.—*Bull calved in* 1886. Three entries.

First Prize, 10*l.*; EARL OF CAWDOR, Stackpole Court, near Pembroke, *Ulundy*; s., Zulu; d., Peggy Lewis 2nd (162).

Second Prize, 5*l.*; Major S. SANDBACK, Hafodunos, Abergele, North Wales, *Owain Ap Gwilym*, 2 y., 4 m., 6 d.; bred by W. Jones, Taihirion, Gaerwen, Anglesea; s., Ap Gwilym; d., Blacken Fawer.

CLASS 69.—*Bull, calved in* 1887. Five entries.

First Prize, 10*l.*; Colonel H. PLATT, Gorddinog, Llanfairfechan, North Wales, *Cromwell*, 1 y., 1 m., 3 w.; s., Ap Gwilym; d., Cariad; s. of d., Grand Duke.

Second Prize, 5*l.*; W. E. OAKELEY, The Plas, Jan-y-Bwlch, Merionethshire, North Wales, *Lord of the Isles*, 1 y., 4 m., 3 w., 6 d.; s., Duke of Chester (20); d., Netty (306).

Reserve and Highly Commended, D. DAVIES, Cruigwheel, Llanybyther, R.S.O., South Wales, 1 y., 3 m., 2 w., 3 d.

Commended, A. M. DUNLOP, Llanbedr, Merionethshire, *Nonconformist*, 11 m., 2 w., 6 d.; s., Enion (92 N.W.B.C., Herd Book); d., Minnie My; s. of d., Black Prince.

CLASS 70.—*Cow, in-Milk or in-Calf, calved before* 1885. Six entries. One withdrawn.

First Prize, 10*l.*; W. E. OAKELEY, The Plas, Jan-y-Bwlch, Merionethshire, North Wales, *Regalia*, 9 y., 5 m.; bred by R. Richard, Victoria Hotel, Llanbedr.

Second Prize, 5*l.*; EARL OF CAWDOR, Stackpole Court, Pembroke, *Rosal 2nd*, 7 y., 2 m., 1 w., 6 d.; bred by Mrs. Williams, Love Lodge, Llandilo; s., Wilfred; d., Rosal; s. of d., Gymro (26).

Reserve and Highly Commended, Colonel H. PLATT, Gorddinog, Llanfairfechan, *Mona's Pride*, 5 y., 2 m.

CLASS 71.—*Heifer, in-Milk or in-Calf, calved in* 1885. Three entries.

First Prize, 10*l.*; Colonel H. PLATT, Gorddinog, Llanfairfechan, 2 y., 9 m., [illegible]; s., Black Boy; d., Queen Nelly; s. of d., Prince of Wales 1st.

Second Prize, 5*l.*; Colonel H. PLATT, 3 y., 4 m.; s., Baronet 1st; d., Black Queen 2nd; s. of d., Prince Llewellyn 1st.

Reserve and Highly Commended, EARL OF CAWDOR, Stackpole Court, Pembroke, *Leonora 2nd*, 3 y., 2 m., 3 w., 6 d.; s., Young King (137); d., Leonora (245).

CLASS 72.—*Heifer, calved in* 1886. Four entries. One withdrawn.

First Prize, 10*l.*; Colonel H. PLATT, Gorddinog, Llanfairfechan, *Princess Jonet*, 2 y., 1 m., 3 w.; s., Baronet 1st; d., Princess of Wales; s. of d., Gelert.

Second Prize, 5*l.*; EARL OF CAWDOR, Stackpole Court, near Pembroke, *Rosal 7th*, 2 y., 1 m., 4 w., 2 d.; s., Young King (137); d., Rosal 2nd (249).

Reserve and Highly Commended, EVAN EVANS, Maesmynach, Llanbyther, Carmarthen, *Kitty*, 2 y., 3 m., 3 d.; s., Prince of Derllys; d., Beauty; s. of d., Granellian.

Commended, W. E. OAKELEY, The Plas, Jan-y-Bwlch, Merionethshire, *Betty*, 2 y., 4 m., 2 w., 6 d.; s., Duke of Chester (20); d., Netty (306).

CLASS 73.—*Heifer, calved in* 1887. Four entries.

First Prize, 10*l.*; W. E. OAKELEY, The Plas, Jan-y-Bwlch, Merionethshire, *Heather Bell*, 1 y., 3 m., 2 w., 5 d.; s., Harlech (96); d., Hatty.

Second Prize, 5*l.*; Colonel H. PLATT, Gorddinog, Llanfairfechan, North Wales, 1 y., 2 m., 2 w.; s., Ap Gwilym; d., Black Queen 3rd; s. of d. Prince Llewellyn 3rd.

Reserve and Highly Commended, Colonel H. PLATT, *Black Queen 6th*, 1 y., 2 m., 3 w.; s., Ap Gwilym; d., Black Queen 2nd; s. of d., Prince Llewellyn.

Commended, EARL OF CAWDOR, Stackpole Court, near Pembroke, *Tidy 7th*, 1 y., 2 m., 1 d.; s., Zulu; d., Tidy 2nd (253).

ANY BREED.

CLASS 74.—*Dairy Cow, in-Milk, of any Breed or Cross (milking qualities to be especially considered).* Eight entries. One withdrawn.

First Prize, 10*l.*; MARQUESS OF BUTE, K.T., Cardiff Castle, Cardiff, red Shorthorn, *Lilly*, 9 y., 3 m.; s., Ruby King; d., Lilly.

Second Prize, 5*l.*;* J. D. WILLIS, Bapton Manor, Codford, roan Shorthorn, 7 y.

Reserve and Highly Commended, LORD TREDEGAR, Tredegar Park, Newport, Monmouthshire, roan Shorthorn, *Lucy 3rd*, 7 y., 4 m., 18 d.; s., Crowned Victor (36,408); d., Lucy 2nd; s. of d., Prince of the Blood (35,160)

Highly Commended, G. TAYLOR, Stanton Prior, near Bristol, roan Shorthorn, *Minnie*, 5 y., 3 m., 3 w., 3 d.; s., Oxford Swell 10th (45,310); d., Margaret; s. of d., General Favourite (38,342).

Commended, P. JENKINS, Upper Grange, Magor, near Newport, Monmouthshire, brown and little white, Shorthorn, *Cricket*, 4 y., 2 m., 1 w., 6 d.; s., Grand Gwyn; d., Cherry.

SHEEP.

LEICESTER.

CLASS 75.—*Shearling Ram.* Four entries.

First Prize, 10*l.*; R. and G. HARRISON, Underpark, Lealholm, Grosmont, Yorkshire, 1 y., 2 m., 2 w.

Second Prize, 5*l.*; J. and D. LINTON, Low Street Brewery, Bedale, Yorkshire, 1 y., 3 m.

Reserve, J. and D. LINTON, 1 y., 3 m.

* Given by the Newport Local Committee.

CLASS 76.—*Pair of Ram Lambs, dropped in* 1888. Three entries.

First Prize, 10*l.*; J. and D. LINTON, Low Street Brewery, Bedale, Yorkshire, 10 w.

Second Prize, 5*l.*; R. and G. HARRISON, Underpark, Lealholm, Grosmont, Yorkshire, 2 m., 2 w.

CLASS 77.—*Pen of Five Shearling Ewes.* Four entries.

First Prize, 10*l.*; Mrs. PERRY-HERRICK, Bean Manor Park, Loughborough, about 1 y., 2 m., 1 w.

Second Prize, 5*l.*; Mrs. PERRY-HERRICK, about 1 y., 2 m., 1 w.

Reserve and Commended, J. and D. LINTON, Low Street Brewery, Bedale, Yorkshire, 1 y., 3 m.

COTSWOLD.

CLASS 78.—*Shearling Ram.* Five entries.

First Prize, 10*l.*; R. SWANWICK, R. A. College Farm, Cirencester, 1 y., 4 m.

Second Prize, 5*l.*; R. SWANWICK, 1 y., 4 m.

Reserve, R. SWANWICK, 1 y., 4 m.

CLASS 79.—*Pair of Ram Lambs, dropped in* 1888. Five entries.

First Prize, 10*l.*; W. THOMAS, The Hayes, Sully, Penarth, 4 m.

Second Prize, 5*l.*; R. SWANWICK, R. A. College Farm, Cirencester, 3 m., 4 w., 2 d.

Reserve, R. SWANWICK, 3 m., 4 w., 2 d.

CLASS 80.—*Pen of Five Shearling Ewes.* Four entries.

First Prize, 10*l.*; G. BAGNALL, Westwell, Burford, Oxon.

Second Prize, 5*l.*; J. MADDOCKS, Llanwarne Court, near Hereford, 1 y., 2 m., 2 w.

Reserve, O. F. WILLIAMS, The Wearend, Ross, Herefordshire.

DEVON LONG-WOOL.

CLASS 81.—*Shearling Ram.* Ten entries.

First Prize, 10*l.*; Sir J. H. HEATHCOTE-AMORY, Bart., Knightshayes, Tiverton, Devonshire, 1 y., 3 m., 2 w.

Second Prize, 5*l.*; A. C. SKINNER, Pound Farm, Bishop's Lydeard, Somersetshire, about 1 y., 4 m., 6 d.

Reserve and Highly Commended, R. FARTHING, Farrington, North Petherton, Bridgwater, 1 y., 3 m., 3 w.

CLASS 82.—*Pair of Ram Lambs, dropped in* 1888. Six entries.

First Prize, 10*l.*; A. C. SKINNER, Pound Farm, Bishop's Lydeard, Somersetshire, about 4 m., 3 w.

Second Prize, 5*l.*; Sir J. H. HEATHCOTE-AMORY, Bart., Knightshayes Court, Tiverton, Devon, about 3 or 4 months.

Reserve and Commended, R. FARTHING, Farrington, North Petherton, Bridgwater, 3 m., 3 w.

CLASS 83.—*Pen of Five Shearling Ewes.* Three entries.

First Prize, 10*l.*; Sir J. H. HEATHCOTE-AMORY, Bart., Knightshayes Court, Tiverton, 1 y., 4 m.

Second Prize, 5*l.*; Sir J. H. HEATHCOTE-AMORY, Bart., 1 y., 3 m., 3 w.

Reserve and Highly Commended, C. NORRIS, Mosshayne, Clyst, Honiton, [illegible] m

OTHER LONG-WOOL BREEDS.

CLASS [illegible].—*Shearling Ram.* First Prize, 10*l.* Second Prize, 5*l.*

[NO ENTRY.]

CLASS 85.—*Pen of Five Shearling Ewes.* First Prize, 10*l.* Second Prize, 5*l.*

[NO ENTRY.]

SOUTHDOWN.

CLASS 86.—*Shearling Ram.* Ten entries.

First Prize, 10*l.*; E. ELLIS, Summersbury, Shalford, near Guildford, 1 y., 3 m., 2 w.

Second Prize, 5*l.*; E. ELLIS, 1 y., 3 m., 2 w.

Reserve and Highly Commended, H.R.H. the PRINCE OF WALES, K.G., Sandringham, Norfolk, 1 y., 3 m., 1 w.

CLASS 87.—*Pair of Ram Lambs, dropped in* 1888. Seven entries.

First Prize, 10*l.*; E. ELLIS, Summersbury, Shalford, Guildford, 3 m., 3 w.

Second Prize, 5*l.*; W. TOOP, Aldingbourne, Chichester, 4 m., 1 w.

Reserve, H.R.H. the PRINCE OF WALES, K.G., Sandringham, Norfolk, 3 m., 1 w.

CLASS 88.—*Pen of Five Shearling Ewes.* Four entries.

First Prize, 10*l.*; E. ELLIS, Summersbury, Shalford, Guildford, 1 y., 3 m., 3 w.

Second Prize, 5*l.*; Sir W. THROCKMORTON, Bart., Buckland, Faringdon, 1 y., 3 m., 2 w.

Reserve and Highly Commended, W. TOOP, Aldingbourne, Chichester, 1 y., 3 m., 3 w.

Commended, H. A. BRASSEY, Preston Hall, Aylesford, 1 y., 3 m., 5 d.

HAMPSHIRE DOWN.

CLASS 89.—*Shearling Ram.* Ten entries.

First Prize, 10*l.*; R. COLES, The Grange, Warminster, about 1 y., 4 m., 2 w., 1 d.

Second Prize, 5*l.*; C. and T. COLES, Manor House, Winterbourne Stoke, Salisbury, 1 y., 4 m.

Reserve and Commended, R. COLES, 1 y., 4 m., 2 w., 2 d.

CLASS 90.—*Pair of Ram Lambs, dropped in* 1888. Five entries.

First Prize, 10*l.*; R. COLES, The Grange, Warminster, Wiltshire, 4 m., 2 w.

Second Prize, 5*l.*; F. R. MOORE, Littlecott, Upavon, Marlborough, 4 m., 3 w., 3 d.

Reserve and Commended, Sir E. HULSE, Bart., Breamore, Salisbury, 4 m., 2 w., 5 d.

CLASS 91.—*Pen of Five Shearling Ewes.* Four entries.

First Prize, 10*l.*; H. PERRY-KEENE, Rowfant, Crawley, Sussex, 1 y., 4 m.

Second Prize, 5*l.*; C. and T. COLES, Manor House, Winterbourne Stoke, Salisbury, about 1 y., 4 m., 1 w.

Reserve and Commended, F. R. MOORE, Littlecott, Upavon, Marlborough, 1 y., 4 m., 3 w.

SHROPSHIRE.

CLASS 92.—*Shearling Ram.* Twenty entries. Two withdrawn.

First Prize, 10*l.*; A. E. MANSELL, Broughton, Harmer Hill, Shrewsbury, 1 y., 3 m.

Second Prize, 5*l.*; J. BOWEN-JONES, Ensdon House, Shrewsbury, about 1 y., 3 m.

Reserve and Highly Commended, A. S. BERRY, Pheasey Farm, Great Barr, Birmingham, 1 y., 3 m.

Highly Commended, J. E. FARMER, Felton, Ludlow, about 1 y., 3 m. :—and T. MANSELL, Harrington Hall, Shifnal, Shropshire, 1 y., 3 m.

Commended, A. E. MANSELL, 1 y., 3 m. :—T. MANSELL, 1 y., 3 m. :—A. S. BERRY, 1 y., 3 m. :—and J. BOWEN-JONES, about 1 y., 3 m.

CLASS 93.—*Pair of Ram Lambs, dropped in* 1888. **Seven entries.**

First Prize, 10*l.*; Sir J. L. E. SPEARMAN, Bart., Llansannor Court, Cowbridge, 3 m., 2 w., 5 d.

Second Prize, 5*l.*; C. LEE CAMPBELL, Glewstone Court, Ross, 3 m., 2 w., 3 d.

Reserve and Highly Commended, A. E. MANSELL, Broughton, Harmer Hill, Shrewsbury, 3 m., 2 w.

Commended, A. E. MANSELL, 3 m., 2 w.

CLASS 94.—*Pen of Five Shearling Ewes.* **Six entries. One withdrawn.**

First Prize, 10*l.*; J. E. FARMER, Felton, Ludlow, about 1 y., 3 m.

Second Prize, 5*l.*; J. PULLEY, Lower Eaton, Herefordshire, 1 y., 3 m., 1 w.

Reserve, C. LEE CAMPBELL, Glewstone Court, Ross, 1 y., 3 m.

OXFORDSHIRE DOWN.

CLASS 95.—*Shearling Ram.* **Seven entries.**

First Prize, 10*l.*; G. ADAMS, Royal Prize Farm, Pidnell, Faringdon, Berkshire, 1 y., 4 m., 3 w.

Second Prize, 5*l.*; T. ARKELL, Pope's Court, Whelford, Fairford, 1 y., 4 m., 1 w.

Reserve and Highly Commended, A. F. M. DRUCE, Fyfield, Abingdon, about 1 y., 4 m.

Commended, C. HOBBS, Maisey Hampton, Fairford, 1 y., 4 m.

CLASS 96.—*Pair of Ram Lambs, got in* 1888. **Seven entries.**

First Prize, 10*l.*; R. W. HOBBS, Kelmscott, Lechlade, about 4 m., 2 w.

Second Prize, 5*l.*; A. F. M. DRUCE, Fyfield, Abingdon, about 4 m.

Reserve and Commended, G. ADAMS, Royal Prize Farm, Pidnell, Faringdon, 5 m.

Commended, G. ADAMS, 5 m.

CLASS 97.—*Pen of Five Shearling Ewes.* **Two entries.**

First Prize, 10*l.*; G. ADAMS, Royal Prize Farm, Pidnell, Faringdon, 1 y., 5 m.

SOMERSET AND DORSET HORN.

CLASS 98.—*Shearling Ram.* **Four entries.**

First Prize, 10*l.*; J. KIDNER, Nynehead, Wellington, Somerset, 1 y., 5 m., 2 w.

Second Prize, 5*l.*; H. FARTHING, Thurloxton, Taunton, 1 y., 5 m., 1 w.

Reserve and Highly Commended, J. KIDNER, 1 y., 5 m., 2 w.

Commended, W. T. CULVERWELL, Durleigh Farm, Bridgwater, 1 y., 5 m., 2 w., 5 d. :—and H. FARTHING, 1 y., 5 m., 1 w.

CLASS 99.—*Pair of Ram Lambs, dropped in* 1888. **Three entries.**

First Prize, 10*l.*; J. KIDNER, Nynehead, Wellington, Somersetshire, 4 m., w., and 3 m., 3 w.

Disqualified, W. T. CULVERWELL, Durleigh Farm, Bridgwater, 5 m., 1 w., d. :—and H. HOLE, Haselbury, near Crewkerne, Somersetshire, 6 m.

CLASS 100.—*Pen of Five Shearling Ewes.* **Five entries.**

First Prize, 10*l.*; J. KIDNER, Nynehead, Wellington, Somersetshire, 1 y., 5 m., 2 w.

Second Prize, 5*l.*; W. T. CULVERWELL, Durleigh Farm, Bridgwater, Dorset Horn, 1 y., 5 m., 3 w., 2 d.

Reserve and Highly Commended, E. J. STANLEY, M.P., Quantock Lodge, Bridgwater, 1 y., 5 m., 3 w.

MOUNTAIN.

CLASS 101.—*Two-Shear or Shearling Ram.* Six entries.

First Prize, 10*l.*; Lord POLTIMORE, Poltimore Park, Exeter, an Exmoor, 1 y., 5 m., 3 w.

Second Prize, 5*l.*; J. ROBSON, Newton, Bellingham, Northumberland, a Cheviot, 1 y., 2 m.

Disqualified, Lord POLTIMORE, an Exmoor, 4 y., 5 m., 1 w.; bred by Earl Fortescue, Castle Hill, South Molton.

CLASS 102.—*Pen of Five Shearling Ewes.* Five entries.

First Prize, 10*l.*; E. J. STANLEY, M.P., Quantock Lodge, Bridgwater, Exmoors, 1 y., 3 m., 5 d.

Second Prize, 5*l.*; Lord POLTIMORE, Poltimore Park, Exeter, Exmoors, 1 y., 5 m., 2 w.

Reserve and Highly Commended, E. J. STANLEY, M.P., Exmoors, 1 y., 3 m., 5 d.

OTHER SHORT-WOOL BREEDS.

CLASS 103.—*Shearling Ram.* Three entries.

First Prize, 10*l.*; F. SHEPHERD, The Brook, Colwall, Malvern, a Ryeland, 1 y., 2 m., 3 w.

Second Prize, 5*l.*; F. SHEPHERD, 1 y., 2 m., 2 w.

Reserve, F. SHEPHERD, 1 y., 2 m., 3 w.

CLASS 104.—*Pen of Five Shearling Ewes.* First Prize, 10*l.* Second Prize, 5*l.*

[NO ENTRY.]

PIGS.

BERKSHIRE.

CLASS 105.—*Boar, farrowed in* 1885 *or* 1886. Four entries.

First Prize, 7*l.*; J. P. KING, North Stoke, Wallingford, Berkshire, *Viscount Moulsford*, 2 y., 1 m., 3 w., 4 d.; s., Lord Moulsford (739); d., Moulsford 31 (730); s. of d., Watchman (485).

Second Prize, 3*l.*; A. E. W. DARBY, Little Ness, Shrewsbury, *Adcote Lad* (689), 3 y., 5 m., 1 d.; s., Speculation (151); d., Shrewsbury Maid; s. of d., Jumbo.

Reserve and Highly Commended, J. SAUNDERS, Sutton, Cranborne, Dorsetshire, *Sampler*, 3 y., 3 m., 3 w., 6 d.; bred by J. P. King, North Stoke, Wallingford; s., Samphire; d., Ruby 3rd; s. of d., Western Walk.

CLASS 106.—*Boar, farrowed in* 1887. Five entries.

First Prize, 7*l.*; A. E. W. DARBY, Little Ness, Shrewsbury, *Terrick Prince*, 1 y., 5 m.; bred by the late L. Ponsonby, Terrick, Tring; s., Royal Duke; d., Terrick Maid; s. of d., Speculation (151).

Second Prize, 3*l.*; J. SAUNDERS, Sutton, Cranborne, Dorsetshire, *Oscar*, 1 y., 2 d.; s., Sambo; d., Sutton Lass; s. of d., Charlton.

Reserve and Highly Commended, J. P. KING, North Stoke, Wallingford,

Berkshire, *Turtle*, 1 y., 2 m., 2 w., 3 d.; s., Tinker 3 (978); d., Ruby 30 (736); s. of d., Samphire (69).

Commended, T. S. HEWER, Knighton, Hungerford, Berkshire, 8 m., 1 w.; s., Weston Beau (751); d., Prize Flower (273); s. of d., Premium (263).

CLASS 107.—*Breeding Sow, farrowed before* 1888. **Twelve entries. One withdrawn.**

First Prize, 7*l.*; J. P. KING, North Stoke, Wallingford, Berkshire, *Lady Compton*, 1 y., 4 m., 1 w., 1 d.; bred by G. F. Vincent, Compton Valence, Dorchester; s., Sampler (1281); d., Compton; s. of d., Prince.

Second Prize, 3*l.*; A. E. W. DARBY, Little Ness, Shrewsbury, 1 y., 3 m., 3 w., 2 d.; s., Lord Conyers (122); d., Preference; s. of d., Speculation (151).

Disqualified, W. RAMSDEN, Westfield House, Knotty Ash, Liverpool, *Sultana 2nd*, 2 y., 2 m., 2 w., 1 d.; s., Sultan; d., Sultana:—N. BENJAFIELD, Short's Green Farm, Motcombe, Shaftesbury, *Blanche*, 1 y., 11 m., 3 w., 4 d.; s., Speculation; d., Queen of the Isles; s. of d., Bingley Lad II.:—and his *Lady Colin B.*, 1 y., 9 m., 4 d.; s., Corp (1263); d., Princess A. (1374); s. of d., President.*

The Class Commended.

CLASS 108.—*Pen of Two Breeding Sows, farrowed in* 1888. Six entries.

First Prize, 7*l.*; EXECUTORS of the late L. PONSONBY, Terrick, Tring, 5 m., 3 d.; bred by Mrs. Ponsonby; s., Terrick Stamford; d., Terrick Paragon.

Second Prize, 3*l.*; N. BENJAFIELD, Short's Green, Motcombe, Shaftesbury, 5 m., 4 d.

Reserve, A. E. W. DARBY, Little Ness, Shrewsbury, 4 m., 1 w., 6 d.; s., Terrick Prince; d., Prescot Maid; s. of d., Speculation (151).

SMALL BLACK BREED.

CLASS 109.—*Boar, farrowed in* 1885 *or* 1886. One entry.

First Prize, 7*l.*; W. S. NORTHEY, Tinhay, Lifton, Devonshire, *Hero*, 2 y., 1 d.; s., Triumph (293); d., Black Diamond (830); s. of d., Sultan (287).

CLASS 110.—*Boar farrowed in* 1887. Two entries.

First Prize, 7*l.*; W. S. NORTHEY, Tinhay, Lifton, Devonshire, *Perfection*, 11 m., 2 w., 2 d.; s., Wonder (459); d., Queen of Diamonds (322); s. of d., Sultan (287).

Second Prize, 3*l.*; W. S. NORTHEY, *Premier*, 11 m., 2 w., 2 d.; s., Wonder, (459); d., Queen of Diamonds (322); s. of d., Sultan (287).

CLASS 111.—*Breeding Sow, farrowed before* 1888. **Two entries.**

First Prize, 7*l.*; W. S. NORTHEY, Tinhay, Lifton, Devonshire, *Black Diamond*, 11 m., 1 w., 5 d.; s. Wonder (459); d., Black Diamond (308); s. of d., Sultan (287).

Second Prize, 3*l.*; W. S. NORTHEY, *Black Diamond*, 11 m., 1 w., 5 d.; s., Wonder (459); d., Black Diamond (308); s. of d., Sultan (287).

CLASS 112.—*Pen of Two Breeding Sows, farrowed in* 1888. First Prize, 7*l.* Second Prize, 3*l.*

[NO ENTRY.]

LARGE BREED (WHITE).

CLASS 113.—*Boar, farrowed in* 1885 *or* 1886. **Three entries.**

First Prize, 7*l.*; J. HOWARD, Clapham Park, Bedford, *Young Champion* [illegible], 2 y., 4 m., 3 w., 4 d.; s., Young Champion (377); d., Beauty IX.; s. of [illegible] Broadhead.

Disqualified, W. RAMSDEN, Westfield House, Knotty Ash, Liverpool, *Hero*, 2 y., 2 m., 2 w., 1 d.; bred by W. Crosby, Apperby Bridge, Yorkshire.

CLASS 114.—*Boar, farrowed in* 1887. Four entries. One withdrawn.

First Prize, 7*l.*; Hon. Mrs. MEYNELL-INGRAM, Temple Newsam, Leeds, *Yorkshire Lad*, 10 m., 2 w.

Second Prize, 3*l.*; J. HOWARD, Clapham Park, Bedford; s., British Prince; d., Strickland 4; s. of d., Britannia Wonder.

CLASS 115.—*Breeding Sow, farrowed before* 1888. Five entries.

First Prize, 7*l.*; Hon. Mrs. MEYNELL-INGRAM, Temple Newsam, Leeds, *Miss Shrewsbury*, 2 y., 1 m.

Second Prize, 3*l.*; F. A. WALKER-JONES, Little Mollington, Chester.

Disqualified, W. RAMSDEN, Westfield House, Knotty Ash, Liverpool, *Nellie*, 2 y., 5 d.

CLASS 116.—*Pen of Two Breeding Sows, farrowed in* 1888. 3 entries.

First Prize, 7*l.*; F. A. WALKER-JONES, Little Mollington, Chester, 4 m., 4 w., 1 d.

Second Prize, 3*l.*; J. HOWARD, Clapham Park, Bedford, 5 m., 2 d.; s., Duke 2nd; d., Beauty XI.; s. of d., Britannia Wonder.

Reserve, J. HOWARD, 4 m., 3 w., 3 d.; s., Duke 1st; d., Strickland 1st; s. of d., Champion III.

MIDDLE WHITE BREED.

CLASS 117.—*Boar, farrowed in* 1885 *or* 1886. Four entries.

First Prize, 7*l.*; F. A. WALKER-JONES, Little Mollington, Chester, 1 y., 10 m.

Second Prize, 3*l.*; E. RILEY, Great Marston, Risbury, Leominster, *Worsley*, 2 y., 1 m., 2 w., 3 d.; bred by Earl of Ellesmere, Worsley.

Disqualified, W. RAMSDEN, Westfield House, Knotty Ash, Liverpool, *Pride of the Ash*, 2 y., 7 m., 1 w.; bred by W. Crosby, Apperley, Yorkshire.

CLASS 118.—*Boar farrowed in* 1887. Two entries.

First Prize, 7*l.*; F. A. WALKER-JONES, Little Mollington, Chester.

Second Prize, 3*l.*—No Competition.

CLASS 119.—*Breeding Sow, farrowed before* 1888. Five entries.

First Prize, 7*l.*; Hon. Mrs. MEYNELL-INGRAM, Temple Newsam, Leeds, *Her Majesty*, 2 y., 9 m., 3 w.

Second Prize, 3*l.*; F. A. WALKER-JONES, Little Mollington, Chester.

Reserve and Highly Commended, J. HOWARD, Clapham Park, Bedford, 1 y., 11 m., 2 w., 5 d.; s., Britannia Wonder; d., Spot.

Disqualified, W. RAMSDEN, Westfield House, Knotty Ash, Liverpool, *Jane*, 2 y., 8 m., 1 w.

The Class Commended.

CLASS 120.—*Pen of two Breeding Sows, farrowed in* 1888. 3 entries.

First Prize, 7*l.*; Hon. Mrs. MEYNELL-INGRAM, Temple Newsam, Leeds, 4 m., 3 w.

Second Prize, 3*l.*; F. A. WALKER-JONES, Little Mollington, Chester, 4 m., 4 w., 2 d.

Disqualified, W. RAMSDEN, Westfield House, Knotty Ash, Liverpool, 6 m., 2 d.; s., Pride of the Ash; d., Mrs. Gladstone.

SMALL WHITE BREED.

CLASS 121.—*Boar, farrowed in* 1885 *or* 1886. Five entries.

First Prize, 7*l.*; EARL OF RADNOR, Coleshill House, Highworth, Wiltshire, 1 y., 7 m., 3 w.; s., Lord Derby; d., Spot; s. of d., Coleshill.

Second Prize, 3*l.*; LORD TREDEGAR, Tredegar Park, Newport, 2 y., 5 m., 4 d.; bred by Earl of Radnor, Buckland, Faringdon; s., Jumbo; d., Grace; s. of d., Lord Derby.

CLASS 122.—*Boar, farrowed in* 1887. Six entries.

First Prize, 7*l.*; F. A. WALKER-JONES, Little Mollington, Chester, 1 y., 5 m.

Second Prize, 3*l.*; Hon. Mrs. MEYNELL-INGRAM, Temple Newsam, Leeds, *Temple Lad*, 1 y., 4 m.

Reserve and Highly Commended, EARL OF RADNOR, Coleshill House, Highworth, Wiltshire, 11 m., 2 w.; s., Peter; d., Lady Emily; s. of d., Cromwell.

Commended, EARL OF RADNOR, 9 m., 2 w.; s., Clanfield; d., Shrewsbury 3rd, s. of d., Gentleman.

CLASS 123.—*Breeding Sow, farrowed before* 1888. Nine entries.

First Prize, 7*l.*; Hon. Mrs. MEYNELL-INGRAM, Temple Newsam, Leeds, *Queen of Temple*, 1 y., 9 m., 3 w.

Second Prize, 3*l.*; F. A. WALKER-JONES, Little Mollington, Chester.

Reserve and Highly Commended, LORD TREDEGAR, Tredegar Park, Newport, 1 y., 3 m., 22 d.

Commended, EARL OF RADNOR, Coleshill House, Highworth, Wiltshire, 1 y., 4 m., 3 w., 4 d.; s., Jumbo; d., Lady Edith; s. of d., Lord Derby.

Disqualified, W. RAMSDEN, Westfield House, Knotty Ash, Liverpool, *Maggie*, 2 y., 3 m.

The Class Commended.

CLASS 124.—*Pen of two Breeding Sows, farrowed in* 1888. 4 entries.

First Prize, 7*l.*; EARL OF RADNOR, Coleshill, Highworth, Wilts, 4 m., 2 d.; s., Clanfield; d., Shaftesbury; s. of d., Gentleman.

Second Prize, 3*l.*; A. H. SLADE, Castle Hill, Addington, Croydon, 5 m., 2 d.; s., Garibaldi (403); d., Beauty (522); s. of d., Warwick.

Reserve, LORD TREDEGAR, Tredegar Park, Newport, Monmouthshire, 3 m., 29 d.

CHEESE.

CLASS 125.—*Lot of Four Cheeses (not less than* 70 *lbs. each), made in* 1887. Twelve entries.

First Prize, 20*l.*; E. HISCOCK, Ashley Farm, Marnhull, Blandford, Dorset.
Second Prize, 10*l.*; H. CANNON, Milton, Clevedon, Evercreech.
Third Prize, 5*l.*; J. HILLARD, Hook Farm, Stoke Trister, Wincanton.
Fourth Prize, 2*l.*; C. CREES, Seymour Court, Beckington, Bath.
Reserve and Very Highly Commended, W. SALMON, Yonder Broadpool Farm, Doulting, Shepton Mallet.
Highly Commended, J. MANFIELD, Hambridge, Currey Rivell, Taunton.
Commended, A. REYNOLDS, Henstridge Factory, Blandford.

CLASS 126.—*Lot of not less than* 2 *cwt. of Cheese (Truckles excepted) made in* 1888; *Exhibitor milking more than* 25 *Cows.* 8 entries.

First Prize, 10*l.*; H. HOLE, Haselbury, Crewkerne.
Second Prize, 5*l.*; T. ALLEN, Crookwood, Devizes.
Third Prize, 2*l.*; H. CANNON, Milton, Clevedon, Evercreech.
Fourth Prize not awarded.

CLASS 127.—*Lot of not less than* 1 *cwt. of Cheese (Truckles excepted), made in* 1888; *Exhibitor milking not more than* 25 *Cows.* Two entries.

First Prize not awarded.
Second Prize, 2*l.*; M. J. WILLIAMS, North Hill Farm, Chew Stoke.
Third and Fourth Prizes not awarded.

CLASS 128.—*Lot of Ten Loaf or other Truckle Cheeses, any age (not including Stilton).* Six entries.

First Prize, 5*l.*; C. CREES, Seymour's Court, Beckington, Bath.
Second Prize, 2*l.*; J. HILLARD, Hook Farm, Stoke Trister, Wincanton.
Third Prize, 1*l.*; H. HOLE, Haslebury, Crewkerne.
Fourth Prize, 10*s.*; H. CANNON, Milton, Evercreech.

CLASS 129.—*Lot of Five Cream or other Soft Cheeses.* Eight entries.

First Prize, 2*l.*; E. BROUGH, Wyndgate, near Scarborough.
Second Prize, 1*l.*; T. WITHEY, Stoke's Croft Branch, London, Gloucester and North Hants Dairy Company, Bristol.
Third Prize, 10*s.*; Professor J. LONG, Graveley Manor, Stevenage.
Commended, C. R. VALENTINE, Dun Cow Dairy, Ludlow.

CLASS 130.—*Lot of not less than half cwt. of Caerphilly Cheeses, not exceeding* 10 *lbs. each.* Six entries.

First Prize, 5*l.*; Mrs. J. DAVIES, Common Farm, Rishton, near Newport, Monmouthshire.
Second Prize, 3*l.*; Mrs. J. BAKER, New House Farm, Wilcrick, near Newport, Monmouthshire.
Third Prize, 2*l.*; P. JENKINS, Upper Grange, Magor, near Newport, Monmouthshire.
Fourth Prize, 10*s.*; Mrs. M. PHILLIPS, Great Newra Farm, Godcliff, near Newport.
Reserved and Commended, Miss H. M. HUGHES, Llanrumney Farm, St. Mellon's, Cardiff.

BUTTER AND CREAM.

CLASS 131.—*Lot of 4 half lbs. of Clotted or Devonshire Cream, packed either in tins or earthen jars.* Eight entries.

First Prize, 2*l.*; CATHEDRAL DAIRY Co., Exeter.
Second Prize, 1*l.*; J. WILLIAMS, Regilbury Park, Winford, near Bristol.
Third Prize, 10*s.*; LONDON, GLOUCESTER, AND NORTH HANTS' DAIRY Co. (Ld.), Whatley Road, Clifton.
Reserved and Very Highly Commended, WEST OF ENGLAND CREAM COMPANY, Poulshot, Devizes, Wiltshire.

CLASS 132.—*Lot of* 6 *lbs. of Fresh (or very slightly Salted) Butter, in half-pounds, made of Cream from Cows other than Channel Island Breeds.* Thirty-nine entries.

First Prize, 5*l.*; Mrs. SAUNDERS, Sutton, Cranborne, Dorsetshire.
Second Prize, 3*l.*; J. WILLIAMS, Regilbury Park, Winford, near Bristol.
Third Prize, 2*l.*; S. J. BODY, Church Farm, High Littleton, Bristol.
Fourth Prize, 1*l.*; F. STRATTON, Machen Plas, Newport, Monmouthshire.
Reserved and Very Highly Commended, M. J. WILLIAMS, North Hill Farm, Chew Stoke.
Highly Commended, G. BREWER, Pilning Farm, Pilning, Gloucestershire:—T. EMERY, Elm Tree Farm, Portbury, Bristol:—E. LEWIS, Cillifwr, Carmarthen:—and WEST OF ENGLAND CREAM COMPANY, Poulshot, Devizes.
Commended, Miss A. BARRON, Borrowfield House, Borrowash, Derby:—T. M. COLLINS, Inst Hill Farm, Olveston, Gloucestershire:—Mrs. E. KNIGHT, Malt House Farm, Haresfield, Stonehouse, Gloucestershire.

CLASS 133.—*Lot of 6 lbs. of Fresh (or very slightly Salted) Butter, in half-pounds, made of Cream from a Dairy in which not more than one-third are Cows of the Channel Island Breeds.* Nine entries.

First Prize, 4*l.*; M. J. WILLIAMS, North Hill Farm, Chew Stoke.
Second Prize, 2*l.*; T. EMERY, Elm Tree Farm, Portbury, Bristol.
Third Prize, 1*l.*; Lieut.-Col. CURTIS-HAYWARD, Quedgley, Gloucestershire.
Fourth Prize, 10*s.*; J. WILLIAMS, Regilbury Park, Winford, near Bristol.
Commended, S. J. BODY, Church Farm, High Littleton, Bristol.

CLASS 134.—*Lot of 6 lbs. of Fresh (of very slightly Salted) Butter, in half-pounds, made of Cream from Cows of the Channel Island Breeds only.* Sixteen entries.

First Prize, 4*l.*; Mrs. M. CUSTANCE, Brook Heath, Breamore, Salisbury.
Second Prize, 2*l.*; Mrs. J. R. WILLATS, Denton Court, Canterbury.
Third Prize, 1*l.*; EARL OF LONDESBOROUGH, Northerwood, Lyndhurst, Hants.
Fourth Prize, 10*s.*; J. WILLIAMS, Regilbury Park, Winford, near Bristol.
Reserved and Highly Commended, Lieut.-Col. J. F. CURTIS-HAYWARD, Quedgley, Gloucestershire.
Highly Commended, Mrs. M. J. CROOKES, Heathfield, Letterston, Pembrokeshire.
Commended, Lord ASHBURTON, The Grange, Alresford, Hampshire:—and R. T. WILLIAMS, Waterloo Farm, Fromefield, Frome, Somerset.

CLASS 135.—*Lot of 4 lbs. of Fresh Butter from any Breed of Cows, made up in at least 4 designs for the table, the elegance of which will be an article of merit.* Six entries.

First Prize, 2*l.*; T. WITHEY, Stokes Croft Branch, London, Gloucester and North Hants Dairy Company, Bristol.
Second Prize, 1*l.*; T. EMERY, Elm Tree Farm, Portbury, Bristol.
Highly Commended, T. COLBORNE, Nantcoch, Newport, Monmouthshire.
Commended, F. STRATTON, Machen Plas, Newport, Monmouthshire.

CLASS 136.—*Lot of 12 lbs. of Salted Butter in a Jar or Crock, to be delivered to the Secretary 4 weeks before the Show.* Seventeen entries.

First Prize, 4*l.*; S. J. BODY, Church Farm, High Littleton, Bristol.
Second Prize, 2*l.*; J. WILLIAMS, Regilbury Park, Winford, near Bristol.
Third Prize, 1*l.*; M. J. WILLIAMS, North Hill Farm, Chew Stoke.
Fourth Prize, 10*s.*; Mrs. E. DAVIES, Capel Dewi, Carmarthen.
Reserve and Commended, Professor J. LONG, Graveley Manor, Stevenage.

BUTTER-MAKING COMPETITIONS.

(In the Working Dairy in the Show Yard. Not open to Makers or Vendors of Churns or their Assistants.)

CLASS 137.—*Best and largest quantity of Butter, made from a given quantity of Cream, in the cleanest and most approved style, on the second day of the Show, open to females only.* Twenty entries.

First Prize, 4*l.*; Miss R. J. MOSS, Bath and Somerset Dairy Co. (Ld.), Kingsmead Buildings, Bath.
Second Prize, 2*l.*; Mrs. E. LEAR, Culm John Farm, Broad Clyst, Exeter.
Third Prize, 1*l.*; Miss H. R. HASSELL, Englesbatch.
Fourth Prize, 10*s.*; Mrs. HOLMES, Home Farm, Leigh, Tonbridge, Kent.
Fifth Prize, 10*s.*; Miss JONES, Ruby's Farm, Nether Stowey, Bridgwater:

Miss KEEL, Stanton Brew, near Bristol:—and Mrs. S. FORD, West End Cottage, Tucking Mill, Tisbury, Wilts.

Highly Commended, Miss E. DAVEY, Cannington, Bridgwater:—Mrs. T. KING, Knowle Hill, Chew Magna:—Miss A. WILLIAMS, North Hill Farm, Chew Stoke:—and Mrs. WILLIAMS, Regilbury Park, Winford, Somerset.

Commended:—Miss S. J. FOWLER, East Harptree, Bristol.

Special award to MARIA PETTERSEN KUNG, Dyurgeaden Covilla, Stockholm.

CLASS 138.—*Best and largest quantity of Butter, made from a given quantity of Cream, in the cleanest and most approved style, on the third day of the Show, open to males and females.* Twenty-two entries.

First Prize, 4*l.*; Miss KEEL, Stanton Drew, Bristol.

Second Prize, 2*l.*; Miss WILLIAMS, North Hill Farm, Chew Stoke.

Third Prize, 1*l.*; Mrs. LEAR, Broad Clyst, Exeter.

Fourth Prize, 10*s.*; Miss HASSELL, Englesbatch.

Fifth Prize, 10*s.*; Miss MOSS, Bath:—Miss DAVEY, Bridgwater:—and Mr. J. BOULTON, London, Gloucester, and North Hants' Dairy Co., Bristol.

Highly Commended, Miss FOWLER, East Harptree, Bristol:—Mrs. WILLIAMS, Winford:—Mr. J. BENSON, Graveley, Stevenage:—Mrs. KING, Knowle Hill, Chew Magna:—Miss MAIDMENT, Polsham, Wells, Somerset:—and Mr. G. GRAY, London, Gloucester, and North Hants' Dairy Co., Bristol.

Commended, Miss BARRON, Borrowash, Derby:—Mrs. HOLMES, Home Farm, Leigh, Tonbridge, Kent:—Miss JONES, Nether Stowey, Bridgwater:—Miss M. BERGMAN, Sweden:—and Miss WINTER, Fowler's Farm, Chedzoy, Somerset.

CLASS 139.—*Best and largest quantity of Butter, made from a given quantity of Cream, in any method most suitable for a small Dairy, on the fourth day of the Show, open to males and females. This Class is especially intended for the instruction and encouragement of those keeping a few Cows*—Sixteen entries.

First Prize, 3*l.*; Mrs. LEAR, Broad Clyst, Exeter.

Second Prize, 2*l.*; Mrs. WILLIAMS, Winford, Somerset.

Third Prize, 1*l.*; Miss HASSELL, Englesbatch.

Fourth Prize, 10*s.*, Miss KEEL, Stanton Drew:—and Mrs. FORD, Tisbury, Wilts.

Fifth Prize, 10*s.*; Mrs. COLLINGS, Weston-super-Mare:—and Mrs. HOLMES, Leigh, Kent.

Highly Commended, Miss FOWLER, East Harptree, Bristol:—Miss GOULSTONE, West Town, R. S. O., Bristol:—Mrs. KING, Chew Magna:—Miss MAIDMENT, Wells:—Miss WILLIAMS, Chew Stoke:—Miss WINTER, Chedzoy:—and Mr. G. W. GRAY, Bristol.

CHAMPION PRIZES.

To be competed for on the fifth day of the Show by the winners of Prizes in the previous Butter-making Competitions. First prize, a Certificate and Gold Medal; second, a Certificate and Silver Medal; third, a Certificate.

First Prize, Miss HASSELL, Englesbatch.

Second Prize, Miss KEEL, Stanton Drew, near Bristol.

Third Prize, Miss DAVEY, Bridgwater.

Very Highly Commended, Mrs. LEAR, Broad Clyst, Exeter:—and Mrs. WILLIAMS, Winford, Somerset.

Highly Commended, Mrs. S. FORD, Tisbury, Wilts:—Miss MOSS, Bath and Somerset Dairy Co., Bath:—Mrs. HOLMES, Tonbridge, Kent:—Miss JONES, Nether Stowey, Bridgwater:—Miss A. WILLIAMS, Chew Stoke:—Mr. J. BOULTON, Bristol:—and Mrs. COLLINGS, Weston-super-Mare.

NEWPORT (MON.) MEETING, 1888.

Award of Prizes for Poultry.

Stewards.—R. H. BUSH: E. J. SANDERS.

Judges.—J. DIXON, North Park, Clayton, Bradford; W. B. TEGETMEIER, 346, Strand, London.

Abbreviations used.—y., year; m., month; w., week.

SECTION I.—GENERALLY USEFUL BREEDS.

CLASS 1.—COCHIN (CINNAMON and BUFF) COCKS. 9 entries.

First Prize, 1*l.* 10*s.*; E. CLATWORTHY, buff, 11 m.
Second Prize, 15*s.*; Mrs. BARTON, buff, over 1 y.
Third Prize, 5*s.*; G. H. PROCTOR, buff, over 1 y.
Very Highly Commended, W. CANNAN, buff; G. H. PROCTOR, buff, over 1 y.
Highly Commended, Mrs. S. R. HARRIS, buff.

CLASS 2.—COCHIN (CINNAMON and BUFF) HENS. 8 entries.

First Prize, 1*l.* 10*s.*; Mrs. S. R. HARRIS, buff.
Second Prize, 15*s.*; W. CANNAN, buff.
Third Prize, 5*s.*; Mrs. BARTON, buff over 1 y.
Very Highly Commended, E. CLATWORTHY, buff, over 1 y.; G. H. PROCTOR, buff, over 1 y.; G. H. PROCTOR, over 1 y.; Ditto, over 1 y.; THODAY and BREEZE, buff.
Highly Commended, E. CLATWORTHY, buff, 11 m.

CLASS 3.—COCHIN (PARTRIDGE-FEATHERED OR WHITE) COCKS. 8 entries.

First Prize, 1*l.* 10*s.*; R. HOLLAND, partridge, 2 y.
Second Prize, 15*s.*; J. WOOD, partridge.
Third Prize, 5*s.*; Mrs. H. J. GOODALL, partridge.
Very Highly Commended, A. E. WARD, partridge.
Highly Commended, J. J. PEARCE, partridge; THODAY and BREEZE, partridge, 2 y.

CLASS 4.—COCHIN (PARTRIDGE-FEATHERED or WHITE) HENS. 4 entries.

First Prize, 1*l.* 10*s.*; Mrs. H. J. GOODALL, partridge.
Second Prize, 15*s.*; A. E. WARD, white.
Third Prize, 5*s.*; J. WOOD, partridge.
Very Highly Commended, J. J. PEARCE, partridge.

CLASS 5.—BRAHMA (DARK) COCKS. 11 entries.

First Prize, 1*l.* 10*s.*; C. D. JONES, 3 y.
Second Prize, 15*s.*; A. E. WARD.
Third Prize, 5*s.*; THODAY and BREEZE, 2 y.
Very Highly Commended, R. HOLLAND, 2 y.; C. D. JONES, 3 y.
Highly Commended, H. LINGWOOD, over 1 y.; J. WOOD.

CLASS 6.—BRAHMA (DARK) HENS. 7 entries.

First Prize, 1*l.* 10*s.*; S. W. THOMAS, over 1 y.
Second Prize, 15*s.*; R. HOLLAND, 18 m.
Third Prize, 5*s.*; A. E. WARD.
Highly Commended, F. S. CLARK, hatched 1887; J. WARR, 1886; THODAY and BREEZE, 2 y.

CLASS 7.—BRAHMA (LIGHT) COCKS. 8 entries.

First Prize, 1*l.* 10*s.*; W. CANNAN.
Second Prize, 15*s.*; THODAY and BREEZE, 2 y.
Third Prize, 5*s.*; A. E. WARD.
Highly Commended, C. R. WILLIAMS.

CLASS 8.—BRAHMA (LIGHT) HENS. 7 entries.

First Prize, 1*l.* 10*s.*; A. E. WARD.
Second Prize, 15*s.*; Rev. W. J. HUMBERSTONE, 1 y.
Third Prize, 5*s.*; Mrs. A. WOOD, 2 y.

CLASS 9.—LANGSHAN COCKS. 6 entries.

First Prize, 1*l.* 10*s.*; R. J. POPE.
Second Prize, 15*s.*; S. MILLARD, 16 m.
Third Prize, 5*s.*; H. M. ORME.

CLASS 10.—LANGSHAN HENS. 7 entries.

First Prize, 1*l.* 10*s.*; R. F. HOUSMAN, 2 y.
Second Prize, 15*s.*; W. M. LANCASTER, hatched 1886.
Third Prize, 5*s.*; H. M. ORME.
Very Highly Commended, C. SEABROOKE.
Highly Commended, R. J. POPE.

CLASS 11.—PLYMOUTH ROCK COCKS. 6 entries.

First Prize, 1*l.* 10*s.*; T. BATTING.
Second Prize, 15*s.*; R. GARLICK.
Third Prize, 5*s.*; W. J. PRIDHAM.
Highly Commended, S. W. THOMAS, over 1 y.

CLASS 12.—PLYMOUTH ROCK HENS. 7 entries.

First Prize, 1*l.* 10*s.*; H. TRINAMAN, over 1 y.
Second Prize, 15*s.*; T. BATTING.
Third Prize, 5*s.*; R. GARLICK.
Highly Commended, H. TRINAMAN, over 1 y.

CLASS 13.—WYANDOTTE COCKS. 8 entries.

First Prize, 1*l.* 10*s.*; P. HANSON, over 1 y.
Second Prize, 15*s.*; W. C. PEIRCE, over 1 y.
Third Prize, 5*s.*; W. C. FURNESS, 2 y.

CLASS 14.—WYANDOTTE HENS. 6 entries.

First Prize, 1*l.* 10*s.*; C. G. BAKER, 2 y.
Second Prize, 15*s.*; Mrs. TOWNSEND, 14 m.
Third Prize, 5*s.*; Mrs. TOWNSEND, 14 m.

CLASS 15.—CHICKENS OF 1888 (COCHIN, BRAHMA, LANGSHAN, PLYMOUTH ROCK, or WYANDOTTE), COCKERELS. 12 entries.

First Prize, 1*l.* 10*s.*; C. D. JONES, *Dark Brahma*, 5 m.
Second Prize, 15*s.*; Rev. H. BURTON, *Light Brahma*, 4½ m.
Third Prize, 5*s.*; T. BATTING, *Plymouth Rock*, 5 m.
Highly Commended, W. BIRD, *Plymouth Rock*, 5 m.; P. HANSON, *Plymouth Rock*, hatched Jan. 8th, 1888; Dr. G. C. SEARLE, *Langshan*, 15 w.

CLASS 16.—CHICKENS OF 1888 (COCHIN, BRAHMA, LANGSHAN, PLYMOUTH ROCK, or WYANDOTTE)—PULLETS. 14 entries.

First Prize, 1*l.* 10*s.*; R. HOLLAND, *Dark Brahma*, 5 m.
Second Prize, 15*s.*; T. BATTING, *Plymouth Rock*, 5 m.
Third Prize, 5*s.*; H. J. WATTS, *Langshan*, 4½ m.
Highly Commended, C. G. BAKER, *Plymouth Rock*, 5 m.; Rev. H. BURTON, *Light Brahma*, 4½ m.; C. D. JONES, *Dark Brahma*, 5 m.; H. LINGWOOD, *Dark Brahma*, 1888; Dr. G. C. SEARLE, *Langshan*, 15 w.
Commended, H. J. WATTS, *Plymouth Rock*, 4½ m.

Section II.—LAYING OR NON-SETTING BREEDS.

Class 17.—SPANISH COCKS. 5 entries.

First Prize, 1*l.* 10*s.*; Lott and Doble, 1 y.
Second Prize, 15*s.*; H. Spriggs, 1 y., 2 m.
Third Prize, 5*s.*; S. H. Hyde, over 1 y.

Class 18.—SPANISH HENS. 12 entries.

First Prize, 1*l.* 10*s.*; Mrs. L. Hake, 14 m.
Second Prize, 15*s.*; Lott and Doble, 1 y.
Third Prize, 5*s.*; E. Skinner.
Very Highly Commended, G. Thornbury, 14 m.
Highly Commended, J. Rawnsley; J. Woods, 2 y.; J. Martin, 1 y.

Class 19.—MINORCA or ANDALUSIAN COCKS. 5 entries.

First Prize, 1*l.* 10*s.*; W. J. Amesbury, *Minorca*, 1887.
Second Prize, 15*s.*; A. G. Pitts, *Minorca*, 13 m.
Third Prize, 5*s.*; W. Cannan, *Minorca.*

Class 20.—MINORCA or ANDALUSIAN HENS. 15 entries.

First Prize, 1*l.* 10*s.*; J. Hopkins, *Minorca.*
Second Prize, 15*s.*; A. G. Pitts, *Minorca*, 13 m.
Third Prize, 5*s.*; W. Cannan, *Minorca.*
Very Highly Commended, J. Hopkins, *Andalusian*; W. Peter, *Minorca*, over 12 m.; A. G. Pitts, *Minorca*, 13 m.
Highly Commended, H. Cattle, *Minorca*, 13 m.; W. Peter, *Minorca*, over 12 m.; S. White, *Minorca*, 15 m.

Class 21.—LEGHORN (Any Variety) COCKS. 7 entries.

First Prize, 1*l.* 10*s.*; W. Cannan.
Second Prize, 15*s.*; J. Pride, hatched 1887.
Third Prize, 5*s.*; J. Pride, hatched 1887.
Highly Commended, W. Laugher, white, 14 m.; W. W. Hall, 14 m.

Class 22.—LEGHORN (Any Variety) HENS. 7 entries.

First Prize, 1*l.* 10*s.*; W. Cannan.
Second Prize, 15*s.*; J. Hurst, 1887.
Third Prize, 5*s.*; J. Pride, hatched 1887.
Very Highly Commended, A. D. Sutcliffe, 1 y.
Highly Commended, J. Hurst, 1886.

Class 23.—HOUDAN COCKS. 6 entries.

First Prize, 1*l.* 10*s.*; S. W. Thomas, over 1 y.
Second Prize, 15*s.*; J. T. Calvert.
Third Prize, 5*s.*; S. W. Thomas, over 1 y.
Highly Commended, P. Hanson, over 1 y.; Rev. S. Mitchison, over 1 y.

Class 24.—HOUDAN HENS. 8 entries.

First Prize, 1*l.* 10*s.*; S. W. Thomas, over 1 y.
Second Prize, 15*s.*; J. T. Calvert.
Third Prize, 5*s.*; S. W. Thomas, over 1 y.
Highly Commended, P. Hanson, over 1 y.

Class 25.—POLISH FOWL, COCKS. 3 entries.

First Prize, 1*l.* 10*s.*; J. Rawnsley.
Second Prize, 15*s.*; J. Rawnsley.
Third Prize, 5*s.*; A. Smith.

Class 26.—POLISH FOWL, HENS. 2 entries.

First Prize, 1*l.* 10*s.*; J. Rawnsley.
Second Prize, 15*s.*; J. Rawnsley.

CLASS 27.—HAMBURG (GOLDEN SPANGLED) COCKS. 4 entries.

First Prize, 1*l.* 10*s.*; H. PICKLES, 18 m.
Second Prize, 15*s.*; W. CANNAN.
Third Prize, 5*s.*; J. RAWNSLEY.
Highly Commended, Mrs. S. R. HARRIS.

CLASS 28.—HAMBURG (GOLDEN SPANGLED) HENS. 3 entries.

First Prize, 1*l.* 10*s.*; Mrs. S. R. HARRIS.
Second Prize, 15*s.*; W. CANNAN.
Third Prize, 5*s.*; A. HOWARD.
Very Highly Commended, J. RAWNSLEY.

CLASS 29.—HAMBURG (SILVER SPANGLED) COCKS. 4 entries.

First Prize, 1*l.* 10*s.*; W. CANNAN.
Second Prize, 15*s.*; H. PICKLES, 18 m.
Third Prize, 5*s.*; J. RAWNSLEY.

CLASS 30.—HAMBURG (SILVER SPANGLED) HENS. 4 entries.

First Prize, 1*l.* 10*s.*; W. CANNAN.
Second Prize, 15*s.*; Mrs. S. R. HARRIS.
Third Prize, 5*s.*; J. RAWNSLEY.
Very Highly Commended, Rev. S. ASHWELL, 2 y.

CLASS 31.—HAMBURG (GOLDEN PENCILLED) COCKS. 6 entries.

First Prize, 1*l.* 10*s.*; H. PICKLES, 18 m.
Second Prize, 15*s.*; W. CANNAN.
Third Prize, 5*s.*; J. RAWNSLEY.

CLASS 32.—HAMBURG (GOLDEN PENCILLED) HENS. 5 entries.

First Prize, 1*l.* 10*s.*; W. CANNAN.
Second Prize, 15*s.*; E. COOKE, 1887.
Third Prize, 5*s.*; J. RAWNSLEY.
Very Highly Commended, E. COOKE, 1887.
Highly Commended, E. COOKE.

CLASS 33.—HAMBURG (SILVER PENCILLED) COCKS. 3 entries.

First Prize, 1*l.* 10*s.*; J. RAWNSLEY.
Second Prize, 15*s.*; W. CANNAN.
Third Prize, 5*s.*; H. PICKLES, 18 m.

CLASS 34.—HAMBURG (SILVER PENCILLED) HENS. 5 entries.

First Prize, 1*l.* 10*s.*; W. CANNAN.
Second Prize, 15*s.*; H. PICKLES, 18 m.
Third Prize, 5*s.*; J. RAWNSLEY.
Highly Commended, J. LAMBERT, 12 m.; A. MACKAY, 12 m.

CLASS 35.—HAMBURG (BLACK) COCKS. 6 entries.

First Prize, 1*l.* 10*s.*; W. CANNAN.
Second Prize, 15*s.*; J. RAWNSLEY.
Third Prize, 5*s.*; T. RYMAN, 1¼ y.
Highly Commended, J. G. YARD, 13 m.: G. J. ROSSER, 1 y., 6 m.

CLASS 36.—HAMBURG (BLACK) HENS. 6 entries.

First Prize, 1*l.* 10*s.*; J. RAWNSLEY.
Second Prize, 15*s.*; W. SNELL, jun.
Third Prize, 5*s.*; G. J. ROSSER, over 1 y.
Very Highly Commended, W. CANNAN; A. D. SUTCLIFFE, 1 y.
Highly Commended, T. RYMAN, 1 y.

CLASS 37.—CHICKENS OF 1888 (SPANISH, MINORCA, LEGHORN, HOUDAN, POLISH, OR HAMBURG)—COCKERELS. 8 entries.

First Prize, 1*l.* 10*s.*; Dr. G. C. SEARLE, *Leghorn*, 15 w.
Second Prize, 15*s.*; L. PEACOCK, *Spanish*, 5 m.
Third Prize, 5*s.*; R. PEEBLES, *Minorca*, 4 m.
Highly Commended, Rev. S. H. MITCHESON, *Houdan*, 1888; C. PAYNE, *Andalusian*, 4½ m.; J. PRIDE, *Leghorn*, 5 m., 3 d.

CLASS 38.—CHICKENS OF 1888 (SPANISH, MINORCA, LEGHORN, HOUDAN, POLISH, or HAMBURG)—PULLETS. 8 entries.

First Prize, 1*l.* 10*s.*; J. BERRY, *Leghorn*, hatched January 2, 1888.
Second Prize, 15*s.*; R. PEEBLES, *Minorca*, 4 m.
Third Prize, 5*s.*; A. SLADE, *Polish*, 5 m.
Highly Commended, J. PRIDE, *Leghorn*, 5m., 3 d.; Dr. G. C. SEARLE, 15 w.

SECTION III.—BREEDS SUITABLE FOR THE TABLE.

CLASS 39.—DORKING (COLOURED) COCKS. 4 entries.

First Prize, 1*l.* 10*s.*; J. HARRIS, over 1 y.
Second Prize, 15*s.*; W. CANNAN.
Third Prize, 5*s.*; B. SMITH.

CLASS 40.—DORKING (COLOURED) HENS. 4 entries.

First Prize, 1*l.* 10*s.*; B. SMITH.
Second Prize, 15*s.*; J. HARRIS, over 1 y.
Third Prize, 5*s.*; R. CHEESEMAN, 3 y.

CLASS 41.—DORKING (SILVER GREY) COCKS. 8 entries.

First Prize, 1*l.* 10*s.*; W. CANNAN.
Second Prize, 15*s.*; Rev. J. H. BROWN, hatched 1886.
Third Prize, 5*s.*; T. ROME, 2 y.
Highly Commended, Mrs. WACHER, 1 y.
Commended, F. W. LOOK, over 1 y.; A. C. MAJOR.

CLASS 42.—DORKING (SILVER GREY) HENS. 10 entries.

First Prize, 1*l.* 10*s.*; A. C. MAJOR.
Second Prize, 15*s.*; F. MARSON.
Third Prize, 5*s.*; Rev. J. H. BROWN, hatched 1886.
Commended, W. CANNAN; O. E. CRESSWELL.

CLASS 43.—DORKING (WHITE OR CUCKOO) COCKS. 7 entries.

First Prize, 1*l.* 10*s.*; A. E. W. DARBY, *white*, over 1 y.
Second Prize, 15*s.*; P. WILSON, *white*, 2 y.
Third Prize, 5*s.*; J. J. MALDEN, *white*, over 1 y.
Highly Commended, J. PETTIPHER, *white*.

CLASS 44.—DORKING (WHITE OR CUCKOO) HENS. 4 entries.

First Prize, 1*l.* 10*s.*; O. E. CRESSWELL, *white*.
Second Prize, 15*s.*; J. J. MALDEN, *white*, over 1 y.
Third Prize, 5*s.*; J. PETTIPHER, *white*.
Highly Commended, A. E. W. DARBY, over 1 y.

CLASS 45.—GAME (BLACK-BREASTED REDS) COCKS. 4 entries.

First Prize, 1*l.* 10*s.*; C. W. BRIERLEY, over 1 y.
Second Prize, 15*s.*; S. MATTHEW, 13 m.
Third Prize, 5*s.*; J. A. DOYLE, 2 y.
Highly Commended, C. and E. JACKSON, Bros., 15 m.

CLASS 46.—GAME (BLACK-BREASTED REDS) HENS. 5 entries.

First Prize, 1*l.* 10*s.*; C. W. BRIERLEY.
Second Prize, 15*s.*; C. W. BRIERLEY.

Third Prize, 5*s.*; S. MATTHEW, 13 m.
Highly Commended, J. A. DOYLE, 1 y.; C. and E. JACKSON, Bros., 13 m.

CLASS 47.—GAME (BROWN-BREASTED REDS) COCKS. 4 entries.

First Prize, 1*l.* 10*s.*; S. MATTHEW, 13 m.
Second Prize, 15*s.*; C. W. BRIERLEY.
Third Prize, 5*s.*; J. EDWARDS, 11 m.

CLASS 48.—GAME (BROWN-BREASTED REDS) HENS. 3 entries.

First Prize, 1*l.* 10*s.*; C. W. BRIERLEY.
Second Prize, 15*s.*; C. W. BRIERLEY.
Third Prize, 5*s.*; S. MATTHEW, 13 m.

CLASS 49.—GAME (PILE OR ANY OTHER VARIETY) COCKS. 4 entries.

First Prize, 1*l.* 10*s.*; C. W. BRIERLEY.
Second Prize, 15*s.*; J. A. DOYLE, *Pile*, 2 y.
Third Prize, 5*s.*; S. MATTHEW, *Pile*, 13 m.

CLASS 50.—GAME (PILE OR ANY OTHER VARIETY) HENS. 5 entries.

First Prize, 1*l.* 10*s.*; C. W. BRIERLEY.
Second Prize, 15*s.*; C. W. BRIERLEY.
Third Prize, 5*s.*; S. MATTHEW, *Pile*, 13 m.
Highly Commended, J. A. DOYLE, *Pile*, 1 y.

CLASS 51.—MALAY COCKS. 5 entries.

First Prize, 1*l.* 10*s.*; G. T. WILLIAMS.
Second Prize, 15*s.*; JOHN FRAYN, over 6 m.
Third Prize, 5*s.*; W. R. LONG, 1 y.
Highly Commended, J. C. HUXTABLE, over 1 y.

CLASS 52.—MALAY HENS. 4 entries.

First Prize, 1*l.* 10*s.*; JOHN FRAYN, over 6 m.
Second Prize, 15*s.*; J. C. HUXTABLE, over 1 y.
Third Prize, 5*s.*; W. R. LONG, 1 y.

CLASS 53.—INDIAN GAME COCKS. 3 entries.

First Prize, 1*l.* 10*s.*; JAMES FRAYNE.
Second Prize, 15*s.*; JOHN FRAYN, over 6 m.
Third Prize, 5*s.*; J. C. HUXTABLE, over 1 y.

CLASS 54.—INDIAN GAME HENS. 3 entries.

First Prize, 1*l.* 10*s.*; JAMES FRAYNE.
Second Prize, 15*s.*; JOHN FRAYN, over 6 m.
Third Prize, 5*s.*; J. C. HUXTABLE, over 1 y.

CLASS 55.—ANY OTHER DISTINCT VARIETY NOT MENTIONED—COCKS. 5 entries.

First Prize, 1*l.* 10*s.*; J. T. CALVERT.
Second Prize, 15*s.*; J. RAWNSLEY.
Third Prize, 5*s.*; A. E. WARD.
Highly Commended, J. J. MALDEN, *Crève Cœur*, over 1 y.; S. W. THOMAS, over 1 y.

CLASS 56.—ANY OTHER DISTINCT VARIETY NOT MENTIONED.—HENS. 3 entries.

First Prize, 1*l.* 10*s.*; J. T. CALVERT.
Second Prize, 15*s.*; J. RAWNSLEY.
Third Prize, 5*s.*; S. W. THOMAS, over 1 y.

CLASS 57—CHICKENS OF 1888 (DORKING, GAME, MALAY, INDIAN GAME, OR ANY OTHER VARIETY NOT MENTIONED)—COCKERELS. 13 entries.

First Prize, 1*l.* 10*s.*; R. B. CURTEIS, *Dorking*, 5 m.
Second Prize, 15*s.*; J. J. MALDEN, *Dorking*, 1888.

Third Prize, 5*s.*; W. Lock, 4 m., 10 d.
Highly Commended, R. B. Curteis, *Dorking*, 5 m.; B. Smith, *Dorking*, 1888.
Commended, F. Tooth, *Dorking*, 1888; A. C. Major, 4½ m.; J. Glasgow, *Pile*, 1888.

Class 58.—CHICKENS OF 1888 (Dorking, Game, Malay, Indian Game, or any Other Variety not mentioned)—PULLETS. 12 entries.

First Prize, 1*l.* 10*s.*; R. Cheeseman, *Dorking*, 4 m.
Second Prize, 15*s.*; R. B. Curteis, *Dorking*, 4½ m.
Third Prize, 5*s.*; J. Robertson, *Dorking*, 18 w.
Highly Commended, J. Glasgow, *Pile*, hatched February 9th, 1888; J. J. Malden, *Dorking*, 1888; B. Smith, *Dorking*, 1888; F. Tooth, *Dorking*, 1888; A. C. Major, 4 m.
Commended, J. Langlands, *Indian Game*, 3½ m.; G. J. Rosser, 3 m., 3 w.

Section IV.—DUCKS, GEESE AND TURKEYS.

Class 59.—DRAKE OR DUCK (ROUEN). *First Prize*, 1*l.* 10*s.*—*Second Prize*, 15*s.*—*Third Prize*, 5*s.*

[No Entry.]

Class 60.—DRAKE OR DUCK (PEKIN OR AYLESBURY). 6 entries.

First Prize, 1*l.* 10*s.*; E. Barnes, *Pekin*, 15 m.
Second Prize, 15*s.*; W. Weston, *Aylesbury*, 2 y., 3 m.
Third Prize, 5*s.*; S. Brown, *Pekin*, 1 y.

Class 61.—COUPLE OF DUCKLINGS (ANY PURE OR CROSS-BRED VARIETY). 1 entry.

Second Prize, 15*s.*; E. Barnes, 2 m.

Class 62.—GANDER OR GOOSE (ANY VARIETY). 3 entries.

First Prize, 1*l.* 10*s.*; W. E. Dainton, *Toulouse*, 2 y.
Second Prize, 15*s.*; J. H. Davis, *Toulouse*, over 1 y.
Third Prize, 5*s.*; J. H. Davis, *Toulouse*, over 1 y.

Class 63.—TURKEYS (COCK OR HEN). 7 entries.

First Prize, 1*l.* 10*s.*; J. Wood.
Second Prize, 15*s.*; Rev. W. J. Humberstone, 1 y.
Third Prize, 5*s.*; J. H. Down, *Canadian Mammoth*, 2 y., 4 d.
Very Highly Commended, Miss S. Burgiss, *Cambridge Bronze*, 2 y.
Highly Commended, B. Read, *Cambridge*, 12 m., 2 w.

Section V.—FANCY BREEDS.

Class 64.—BANTAM (Black or White) COCKS. 7 entries.

First Prize, 1*l.*; W. Cannan, *black*.
Second Prize, 10*s.*; D. England, *black*.
Third Prize, 5*s.*; F. Danells, *black*, 1887.
Very Highly Commended, T. F. Phelps, *black*, 2 m.
Highly Commended, A. Howard, *black*.

Class 65.—BANTAM (Black or White) HENS. 13 entries.

First Prize, 1*l.*; W. Birchall, *black*, 1 y.
Second Prize, 10*s.*; T. F. Phelps, *black*, 12 m.
Third Prize, 5*s.*; W. Cannan, *black*.
Very Highly Commended, W. Cannan, *black*; O. E. Cresswell, *white*; England, *black*; A. Howard, *black*.
Highly Commended, J. Weaver, 1887.

CLASS 66.—BANTAM (GAME, ANY VARIETY) COCKS. 10 entries.

First Prize, 1*l.*; R. Y. ARDAGH, *black red*, 17 m.
Second Prize, 10*s.*; J. W. MAYO, 18 m.
Third Prize, 5*s.*; W. T. HINTON, hatched 1887.
Very Highly Commended, G. LEWIS, *brown red*, various; E. C. PHILLIPS, *Duckwing*, 1 y.; J. WEAVER, 1887.
Highly Commended, G. TAYLOR, 1887.

CLASS 67.—BANTAM (GAME, ANY VARIETY) HENS. 4 entries.

First Prize, 1*l.*; J. W. MAYO, 4 y.
Second Prize, 10*s.*; G. TAYLOR, 1887.
Third Prize, 5*s.*; R. Y. ARDAGH, *black red.*

CLASS 68.—BANTAM (ANY OTHER DISTINCT VARIETY) COCKS. *First Prize*, 1*l.*—*Second Prize*, 10*s.*—*Third Prize*, 5*s.*

[NO ENTRY.]

CLASS 69.—BANTAM (ANY OTHER DISTINCT VARIETY) HENS. 1 entry.

Second Prize, 10*s.*; A. W. COVELL, *Silver Sebright*, 2 y.

SECTION VI.—EGGS.

CLASS 70.—ONE DOZEN OF BROWN NEW-LAID EGGS (SINGLE YOLKS). 3 entries.

First Prize, 1*l.*; H. JOHNSON.
Second Prize, 10*s.*; Mrs. TOWNSEND.

CLASS 71.—ONE DOZEN OF WHITE NEW-LAID EGGS (SINGLE YOLKS). 4 entries.

First Prize, 1*l.*; T. ALLEN.
Second Prize, 10*s.*; H. JOHNSON.
Third Prize, 5*s.*; Mrs. M. WILLIAMS.

HORSE-SHOEING COMPETITION. Fifty-one entries.

OPEN TO SHOEING SMITHS.

First Prize, 3*l.* 3*s.*; E. SYMES, Bristol House, Shirehampton.
Second Prize, 2*l.* 2*s.*; E. DAVIES, Castle St., Merthyr Tydvil.
Third Prize, 1*l.* 1*s.*; D. FRANCIS, Merthyr Tydvil.
Highly Commended, H. A. V. HOPTON, jun., Worcester St., Gloucester:—H. MINTON, Lystone, Llanwarne:—and T. THOMAS, 8 Ambra Vale East, Clifton Wood, Bristol.
Commended, C. HOLCOMBE, Weston, Bath:—J. PUGSLEY, Speke St., Maindee, Newport, Mon.:—and J. SELWAY, 33 Middle St., Yeovil.

WORKMEN'S EXHIBITION.
TECHNICAL AND AMATEUR WORK.

JUDGES.

CLASSES 1 and 3.—H. BEYNON, Esq., Newport.
CLASS 2.—H. O. RICHES, Esq. Cardiff.
CLASSES 3A, 4 to 19.—and 22, H. M. CUNDALL, ESQ., South Kensington Museum.
CLASSES 20 and 21.—Mrs. C. LEWIS, Mrs. H. MULLOCK, Mrs. J. T. TURNER.

CLASS 1. Models of Steamships—1st, THOMAS JONES.
CLASS 2. Models of Steam Engines—1st, J. M. KAIG; 2nd, WILLIAM MOORE; extra prize, 10s., WILLIAM YOUNG.
CLASS 3. Models of Ships or Boats—1st, TOM THOMAS; 2nd, F. C. ORDERS.
CLASS 3A. Models of Buildings, Colliery Work, or Furniture—1st, F. SEARY; 2nd, J. BALACHET.
CLASS 4. Specimens of Handicraft by Artizans in their own trade: Printing —1st, JOSEPH TROAKES; 2nd, PERCY DOWLAND.
CLASS 5. Lithography—1st, H. BOWDEN; 2nd, NELSON LEWIS.
CLASS 6. Bookbinding—1st, E. W. HILL; 2nd, H. DIGHT.
CLASS 7. Engraving—2nd, J. BARRY.
CLASS 8. Photography—1st, H. DUNNING.
CLASS 9. Fretwork—1st, G. A. DANIEL; 2nd, I. BROOM.
CLASS 10. Wood-carving—2nd, F. H. FREDERICK.
CLASS 11. Wood-turning—1st, W. E. WILLIAMS; 2nd, W. HOUGHTON.
CLASS 11*a*. Modelling in Clay and Plastic Work—1st, B. D. BROOKS; 2nd, JESSE DAVIS.
CLASS 12. Ornamental Iron or other Metal Work—2nd, A. A. COLES.
CLASS 13. Stone Carving—2nd, H. WALL.
CLASS 15. House Decorating, including Panel Work and Stencilling—1st, J. SHEWRING, sen.
CLASS 16. Graining and Marbling—1st, G. COLE; 2nd, 10s. each, G. JONES and J. PHILLIPS; extra prize, 10s., R. BROWN.
CLASS 17. Amateur Work: Folding Screen or other Decoration—1st, S. J. WILLIAMS; 2nd, M. A. FOWLER.
CLASS 18. Illuminating a Painting on Pottery, China, or Glass—1st, LIZZIE DAVIES; 2nd, Miss PURDEN.
CLASS 18*a*. Photography—1st, A. H. TOWNSEND; 2nd, J. S. KERSLAKE; extra prize, 15s., W. BUSH.
CLASS 19. Stuffed Birds or Animals—2nd, T. ROBERTS.
CLASS 20. Woolwork, Embroidery, and Fancy Needlework.
CLASS 20*a*. Framed Wool Work or Silk Work—1st, 10s., J. SNELLING; 2nd, 5s., L. R. BAILEY; Commended, C. W. J. PHILLIPS, JAMES JONES, and E. STANTON.
CLASS 20*b*. Quilts—1st, 5s., G. T. ALLEN ; JOSEPHINE FISHER.
CLASS 20*c*. Crotchet Wool Work, or Thread Work—1st, 5s., G. T. ALLEN; JOSEPHINE FISHER.
CLASS 20*d*. Embroidery—1st, 10s., B. BAILEY; 2nd, 5s., L. G. TAYLOR; Commended, BLANCHE CLUTTERBUCK, Mrs. TOWNSEND, and ADA WILLIAMS.
CLASS 21. Plain Needlework—1st, MINNIE PARKER; 2nd, S. A. GARLAND; Commended, NELLIE PARKINSON and S. E. PARKINSON.
CLASS 22. Handwriting, Ten Commandments—1st, ERNEST EVANS, Fair Oak Avenue, Maindee; 2nd, ETHEL HARVEY, Tunnel Terrace.
EXTRA PRIZES. Netting—THOMAS WILLIAMS. Lace—KATE EVANS.

CHAS. D. PHILLIPS.
A. A. NEWMAN. } Hon. Local Secs.
T. PARRY.

Bath and West of England Society

(ESTABLISHED 1777,)

AND

Southern Counties Association,

FOR THE

Encouragement of Agriculture, Arts, Manufactures, and Commerce.

Patron:.
HIS ROYAL HIGHNESS THE PRINCE OF WALES, K.G.

President for 1888-9:
THE RT. HON. THE LORD CLINTON.

PRIZES

OFFERED FOR

HORSES, CATTLE, SHEEP, PIGS, CHEESE, BUTTER, CREAM, BUTTER-MAKING, AND HORSE SHOEING.

AT THE MEETING TO BE HELD AT

EXETER,

ON WEDNESDAY, JUNE 5, THURSDAY, JUNE 6, FRIDAY, JUNE 7, SATURDAY, JUNE 8, AND MONDAY, JUNE 10, 1889.

Entries must reach the Secretary, THOS. F. PLOWMAN, 4, Terrace Walk, Bath, with all Fees and Subscriptions due, on or before

APRIL 18.

Post Entries will be received, at DOUBLE FEES, up to APRIL 25, after which date no Entries (except those for Horse-Shoeing) can be received under any circumstances.

EXETER MEETING.

June 5, 6, 7, 8, and 10.

SUMMARY OF PRIZE SHEET.

No. of Classes.		Amount offered in Prizes. £ s. d.	£ s. d.
	Horses.		
6	Agricultural ..	135 0 0	
7	Hunters	175 0 0	
2	Hacks	25 0 0	
2	Ponies	18 0 0	
3	Harness	40 0 0	
20			393 0 0
	Cattle.		
7	Devon	180 0 0	
7	Shorthorn ..	180 0 0	
7	Hereford.. ..	180 0 0	
7	Sussex	180 0 0	
7	Guernsey ..	180 0 0	
7	Jersey	180 0 0	
1	Dairy	18 0 0	
43			1098 0 0
	Sheep.		
3	Leicester ..	45 0 0	
3	Cotswold :	45 0 0	
3	Devon Long Wool	45 0 0	
2	Other Long Wool Breeds	30 0 0	
3	Southdown ..	45 0 0	
3	Hampshire Down	45 0 0	
3	Shropshire ..	45 0 0	
3	Oxfordshire Down ..	45 0 0	
	Carried forward	345 0 0	1491 0 0
23	Brought forward	345 0 0	1491 0 0
	Sheep—*contd.*		
3	Somerset and Dorset Horn	45 0 0	
2	Mountain ..	30 0 0	
2	Other Short Wool Breeds	30 0 0	
30			450 0 0
	Pigs.		
4	Berkshire ..	40 0 0	
4	Small Black ..	40 0 0	
4	Large White ..	40 0 0	
4	Middle White	40 0 0	
4	Small White ..	40 0 0	
20			200 0 0
	Dairy.		
4	Cheese	64 0 0	
8	Butter and Cream	50 0 0	
4	Butter-making Competitions	29 0 0	
16			143 0 0
			2284 0 0
71	Poultry	..	171 0 0
1	Horse Shoeing	..	6 6 0
			2461 6 0

MEDALS AND PLATES.

...tion to the above Prizes, there are offered:—

... Gold, a Silver, and a Bronze Medal, in the Jersey Cattle Classes, by the English Jersey Cattle Society.

...ree Silver Medals, in the Guernsey Cattle Classes, by the English Guernsey Cattle Society.

...old and a Silver Medal, in the Butter-making Classes, by the Society.

...wo Silver Cups, in the Poultry Classes, by the Proprietors of the "Field," and W. B. ...[illegible]

PRIZES.

HORSES.	First Prize.	Second Prize.	Third Prize.
	£	£	£
Agricultural.			
Class 1.—Stallion, foaled before 1887	25	10	
Class 2.—Stallion, foaled in 1887	20	10	
Class 3.—Colt, foaled in 1888	10	5	
Class 4.—Mare and Foal, or in-Foal	15	10	
Class 5.—Filly, foaled in 1886	10	5	
Class 6.—Filly, foaled in 1887	10	5	
Hunters.			
Class 7.—Mare or Gelding, foaled before 1885, up to 14 stone	25	10	
Class 8.—Mare or Gelding, foaled before 1885, up to 12 stone and under 14 stone	25	10	
Class 9.—Mare or Gelding, foaled in 1885	20	10	
Class 10.—Filly or Gelding, foaled in 1886	10	5	
Class 11.—Filly or Gelding, foaled in 1887	10	5	
Class 12.—Filly or Colt, foaled in 1888	10	5	
Class 13.—Mare and Foal, or in-Foal	20	10	
Hacks.			
Class 14.—Mare or Gelding, over 14·2 hands	10	5	
Class 15.—Mare and Foal, or in-Foal, not over 14·2 hands	7	3	
Ponies.			
Class 16.—Mare or Gelding, not over 13 hands	7	3	
Class 17.—Mare and Foal, or in-Foal, not over 13 hands	5	3	
Harness.			
Class 18.—Mare or Gelding, over 14 hands and not over 15·2	10	5	
Class 19.—Mare or Gelding, over 13 hands and not over 14	10	5	
Class 20.—Mare or Gelding, under 13 hands	7	3	
CATTLE.			
DEVON.			
Class 21.—Bull, calved in 1885 or 1886	15	10	5
Class 22.—Bull, calved in 1887	15	10	5
Class 23.—Bull, calved in 1888	15	10	3

CATTLE—*continued.*	First Prize.	Second Prize.	Third Prize.
	£	£	£
Class 24.—Cow, in-Milk or in-Calf, calved before 1886	15	10	3
Class 25.—Heifer, in-Milk or in-Calf, calved in 1886	15	10	3
Class 26.—Heifer, calved in 1887	10	5	3
Class 27.—Heifer, calved in 1888	10	5	3
SHORT-HORN.			
Class 28.—Bull, calved in 1885 or 1886 . . .	15	10	5
Class 29.—Bull, calved in 1887	15	10	5
Class 30.—Bull, calved in 1888	15	10	3
Class 31.—Cow, in-Milk or in-Calf, calved before 1886	15	10	3
Class 32.—Heifer, in-Milk or in-Calf, calved in 1886	15	10	3
Class 33.—Heifer, calved in 1887	10	5	3
Class 34.—Heifer, calved in 1888	10	5	3
HEREFORD.			
Class 35.—Bull, calved in 1885 or 1886 . . .	15	10	5
Class 36.—Bull, calved in 1887	15	10	5
Class 37.—Bull, calved in 1888	15	10	3
Class 38.—Cow, in-Milk or in-Calf, calved before 1886	15	10	3
Class 39.—Heifer, in-Milk or in-Calf, calved in 1886	15	10	3
Class 40.—Heifer, calved in 1887	10	5	3
Class 41.—Heifer, calved in 1888	10	5	3
SUSSEX.			
Class 42.—Bull, calved in 1885 or 1886 . . .	15	10	5
Class 43.—Bull, calved in 1887	15	10	5
Class 44.—Bull, calved in 1888	15	10	3
Class 45.—Cow, in-Milk or in-Calf, calved before 1886	15	10	3
Class 46.—Heifer, in-Milk or in-Calf, calved in 1886	15	10	3
Class 47.—Heifer, calved in 1887	10	5	3
Class 48.—Heifer, calved in 1888	10	5	3
JERSEY.			
Class 49.—Bull, calved in 1885 or 1886 . . .	15	10	5
Class 50.—Bull, calved in 1887	15	10	5
Class 51.—Bull, calved in 1888	15	10	3
Class 52.—Cow, in-Milk or in-Calf, calved before 1886	15	10	3
Class 53.—Heifer, in-Milk or in-Calf, calved in 1886	15	10	3
Class 54.—Heifer, calved in 1887	10	5	3
Class 55.—Heifer, calved in 1888	10	5	3

The following Prizes are offered by the English Jersey Cattle Society for the 1st, 2nd and 3rd Best Cow or Heifer, in the Jersey Classes, eligible for the English Jersey Herd Book, subject to a Butter test:—

1st Prize—A Gold Medal.
2nd „ —A Silver Medal.
3rd „ —A Bronze Medal.

CATTLE—*continued.*	First Prize.	Second Prize.	Third Prize.
GUERNSEY.	£	£	£
CLASS 56.—Bull, calved in 1885 or 1886 . . .	15	10	5
CLASS 57.—Bull, calved in 1887	15	10	5
CLASS 58.—Bull, calved in 1888	15	10	3
CLASS 59.—Cow, in-Milk or in-Calf, calved before 1886	15	10	3
CLASS 60.—Heifer, in-Milk or in-Calf, calved in 1886	15	10	3
CLASS 61.—Heifer, calved in 1887	10	5	3
CLASS 62.—Heifer, calved in 1888	10	5	3
Three Special Prizes of Silver Medals are offered by the English Guernsey Cattle Society: For the Best Bull, Cow and Heifer, in the Guernsey Classes, bred in England, and eligible for the English Guernsey Cattle Society's Herd Book.			
ANY BREED.			
CLASS 63.—Dairy Cow, in-Milk, of any breed or cross (milking qualities to be especially considered)	10	5	3
(N.B.—Animals entered in other Classes are not eligible to compete in the above class.)			

SHEEP.			
LEICESTER.			
CLASS 64.—Shearling Ram	10	5	
CLASS 65.—Pair of Ram Lambs, dropped in 1889 .	10	5	
CLASS 66.—Pen of five Shearling Ewes . . .	10	5	
COTSWOLD.			
CLASS 67.—Shearling Ram	10	5	
CLASS 68.—Pair of Ram Lambs, dropped in 1889 .	10	5	
CLASS 69.—Pen of five Shearling Ewes . . .	10	5	
DEVON LONG-WOOL.			
CLASS 70.—Shearling Ram	10	5	
CLASS 71.—Pair of Ram Lambs, dropped in 1889 .	10	5	
CLASS 72.—Pen of five Shearling Ewes . . .	10	5	
OTHER LONG-WOOL BREEDS.			
CLASS 73.—Shearling Ram	10	5	
CLASS 74.—Pen of five Shearling Ewes . . .	10	5	

SHEEP—*continued.*	First Prize.	Second Prize.	Third Prize.
	£	£	£
SOUTHDOWN.			
Class 75.—Shearling Ram	10	5	
Class 76.—Pair of Ram Lambs, dropped in 1889	10	5	
Class 77.—Pen of five Shearling Ewes	10	5	
HAMPSHIRE DOWN.			
Class 78.—Shearling Ram	10	5	
Class 79.—Pair of Ram Lambs, dropped in 1889	10	5	
Class 80.—Pen of five Shearling Ewes	10	5	
SHROPSHIRE.			
Class 81.—Shearling Ram	10	5	
Class 82.—Pair of Ram Lambs, dropped in 1889	10	5	
Class 83.—Pen of five Shearling Ewes	10	5	
OXFORDSHIRE DOWN.			
Class 84.—Shearling Ram	10	5	
Class 85.—Pair of Ram Lambs, dropped in 1889	10	5	
Class 86.—Pen of five Shearling Ewes	10	5	
SOMERSET AND DORSET HORN.			
Class 87.—Shearling Ram	10	5	
Class 88.—Pair of Ram Lambs, dropped after Dec. 1st, 1888	10	5	
Class 89.—Pen of five Shearling Ewes	10	5	
MOUNTAIN.			
Class 90.—Two Shear or Shearling Ram	10	5	
Class 91.—Pen of five Shearling Ewes	10	5	
OTHER SHORT-WOOL BREEDS.			
Class 92.—Shearling Ram	10	5	
Class 93.—Pen of five Shearling Ewes	10	5	
PIGS.			
BERKSHIRE.			
Class 94.—Boar, farrowed in 1886 or 1887	7	3	
Class 95.—Boar, farrowed in 1888	7	3	
Class 96.—Breeding Sow, farrowed before 1889	7	3	
Class 97.—Pen of two Breeding Sows, farrowed in 1889	7	3	
SMALL BLACK BREED.			
Class 98.—Boar, farrowed in 1886 or 1887	7	3	
Class 99.—Boar, farrowed in 1888	7	3	
Class 100.—Breeding Sow, farrowed before 1889	7	3	
Class 101.—Pen of two Breeding Sows, farrowed in 1889	7	3	

PIGS—*continued.*	First Prize.	Second Prize.	Third Prize.		Fourth Prize.	
LARGE WHITE BREED.	£	£	£	s.	£	s.
CLASS 102.—Boar, farrowed in 1886 or 1887 .	7	3				
CLASS 103.—Boar, farrowed in 1888 . .	7	3				
CLASS 104.—Breeding Sow, farrowed before 1889	7	3				
CLASS 105.—Pen of two Breeding Sows, farrowed in 1889 . . .	7	3				
MIDDLE WHITE BREED.						
CLASS 106.—Boar, farrowed in 1886 or 1887 .	7	3				
CLASS 107.—Boar, farrowed in 1888 . .	7	3				
CLASS 108.—Breeding Sow, farrowed before 1889	7	3				
CLASS 109.—Pen of two Breeding Sows, farrowed in 1889 . . .	7	3				
SMALL WHITE BREED.						
CLASS 110.—Boar, farrowed in 1886 or 1887 .	7	3				
CLASS 111.—Boar, farrowed in 1888 . .	7	3				
CLASS 112.—Breeding Sow, farrowed before 1889	7	3				
CLASS 113.—Pen of two Breeding Sows, farrowed in 1889 . . .	7	3				
CHEESE.						
CLASS 114.—Lot of four Cheeses (not less than 70 lbs. each), made in 1888 .	20	10	4	0	1	0
CLASS 115.—Lot of not less than 2 cwt. of Cheese (Truckles excepted), made in 1889	10	5	2	0	1	0
CLASS 116.—Lot of ten Loaf, or other Truckle Cheeses, any age (not including Stilton)	4	2	1	0	0	10
CLASS 117.—Lot of five Cream or other Soft Cheeses	2	1		10		
BUTTER AND CREAM.						
CLASS 118.—Lot of 6 lbs. of Fresh (or very slightly salted) Butter, in half pounds, made of cream from cows other than Channel Island Breeds	5	3	2	0	1	0
CLASS 119.—Lot of 6 lbs. of Fresh (or very slightly salted) Butter, in half pounds, made of cream from a Dairy in which not more than one-third are cows of the Channel Island Breeds	4	2	1	0	0	10

BUTTER AND CREAM—*contd.*	First Prize.	Second Prize.	Third Prize.	Fourth Prize.
	£ s.	£ s.	£ s.	£ s.
CLASS 120.—Lot of 6 lbs. of Fresh (or very slightly salted) Butter, in half pounds, made of cream from cows of Channel Island Breeds only	4 0	2 0	1 0	0 10
The Prizes in Class 121 are given by Mr. J. H. Stanbury, Royal Clarence Hotel, Exeter:				
CLASS 121.—Lot of 6 lbs. of Fresh (or very slightly salted) Butter, in half pounds, made from scalded cream, by residents in the county of Devon . . .	2 10	1 10	1 0	
The Prizes in Class 122 are given by C. T. D. Acland, Esq., M.P.:				
CLASS 122.—Lot of 6 lbs. of Fresh (or very slightly salted) Butter, in half pounds, made from scalded cream, by residents in the county of Cornwall. . .	2 10	1 10	1 0	
CLASS 123.—Lot of 4 lbs. of Fresh Butter from any breed of cows, made up in at least four designs of an elegant character for the table .	2 0	1 0		
CLASS 124.—Lot of 12 lbs. of Salted Butter, in a jar or crock, to be delivered to the Secretary four weeks before the Show	4 0	2 0	1 0	0 10
CLASS 125.—Lot of 4 half-lbs. of Clotted or Devonshire Cream, packed either in tins or earthen jars .	2 0	1 0	0 10	
BUTTER-MAKING COMPETITIONS.				
(To take place in the Working Dairy in the Showyard. Not open to Makers or Vendors of Churns or their assistants.)				
CLASS 126.—Best and largest quantity of Butter, made from a given quantity of cream, in the cleanest and most approved style, on the 1st day of the Show	4 0	2 0	1 0	0 10
Class 126 is limited to Students who have attended a course of instruction at any of the Society's Dairy Schools.				
CLASS 127.—Best and largest quantity of Butter, made from a given quantity of cream, in the cleanest and most approved style, on the 2nd day of the Show, open to any female without restriction . . .	4 0	2 0	1 0	0 10

	First Prize.		Second Prize.		Third Prize.		Fourth Prize.	
BUTTER-MAKING COMPETITIONS—*continued.*	£	s.	£		£	s.	£	s.
CLASS 128.—Best and largest quantity of Butter, made from a given quantity of cream, in the cleanest and most approved style, on the 3rd day of the Show, open to any male or female, except the winner of the 1st Prize in Class 127 .	4	0	2	0	1	0	0	10
CLASS 129.—Best and largest quantity of Butter, made from a given quantity of cream, in the cleanest and most approved style, on the 4th day of the Show, open to any male or female, except the winners of the 1st Prizes in Classes 127 and 128	3	0	2	0	1	0	0	10
CHAMPION PRIZES.								
The following Prizes will be competed for on the 5th day of the Show by the winners of Prizes in Classes 126, 127, 128 and 129:— 1st Prize—A Gold Medal and Certificate. 2nd „ A Silver Medal and Certificate. 3rd „ A Certificate.								
HORSE-SHOEING COMPETITION.								
CLASS 130.—Best Shoeing of a Nag Horse by a Smith in the Showyard on the 3rd day of Show . . .	3	3	2	2	1	1		
Certificates of Commendation will also be awarded where deserved, and a Set of Models for Shoeing to each winner of a Prize or Commendation. (See Special Regulations on p. lxii.)								

CONDITIONS AND REGULATIONS FOR LIVE-STOCK, CHEESE AND BUTTER.

GENERAL.

Entries.

1. Exhibitors may make an unlimited number of entries in each Class (except those for Cheese, Butter, and Cream) on payment of the following Fees, providing the Entries reach the Secretary on or before April 18; after that date and up to April 25, Entries will only be received *on payment of double fees* in each case:—

		Members.	Non-members.
Horses	for each Entry	20*s*.	.. 30*s*.
Ponies, Cattle, Sheep, and Pigs	do.	5*s*.	.. 15*s*.
Cheese, Class 114	do.	10*s*.	.. 20*s*.
Do. Classes 115 to 117	do.	5*s*.	.. 10*s*.
Butter, Cream, and Butter-makers ..	do.	2*s*. 6*d*.	.. 5*s*.

The above Fees must be paid when the Entries are made.

2. In order to enter at the reduced Fees, a Member must have been elected on or before January 29, 1889, and must subscribe not less than 1*l*. annually.

3. Where a Prize is offered for a *pair* or *pen* of animals, Single Entry-fees only are payable for each *pair* or *pen*, and only one Entry-form must be used.

4. All Entries must be made on the printed forms to be obtained of the Secretary (Thos. F. Plowman, 4, Terrace Walk, Bath), and in applying for Forms Exhibitors are requested to state how many Entries they wish to make of either Horses, Cattle, Sheep, or Pigs, as each Stock Entry must be made on a separate Form.

5. All Entry-forms must be signed by the Exhibitor or his Agent. Exhibitors are requested to carefully examine the List of Prizes and Conditions, as the Society cannot be responsible for any errors made by Exhibitors in their Entry-forms. An Exhibitor omitting to give information asked for on the Entry-form, with regard to the age, name, colour, sire, dam, &c., of an animal, will be liable to have his Entry disqualified.

6. In no case can the same Animal or Article be entered in two Classes.

7. All Animals or Articles exhibited must be *bonâ fide* the property of the Exhibitor at and from the time of Entry, and, in the case of an imported animal, the shipping certificate must be produced to the Secretary, in proof that the animal was in this country at the time of Entry.

Showyard.

8. The Yard will be open for the reception of Horses, Cattle, Sheep, Pigs, Cheese, Butter and Cream, on Monday and Tuesday, the 3rd and 4th of June, from 7 A.M. to 6 P.M. Horses, Cheese, Butter and Cream will also be received from 6 to 8 o'clock on the morning of the first day of Show, but all other Entries must be in the Yard the previous day. The label sent by the Secretary must be properly affixed to the head of each Animal, or, in the case of Cheese, Butter or Cream, to the basket or box.

9. All Stock and Articles, and all Servants in charge of the same, admitted into the Showyard, will be subject to the Orders, Regulations, and Rules of the Society.

10. All Stock and Articles, except Horses (see Conditions 27 and 28), must remain in the Showyard until 6 P.M. on the last day of Show.

11. No Animal can be permitted to be removed from its place without

leave from the Steward of the Department, or can leave the Yard till the metal label denoting its number is given up to the Gatekeeper.

12. The Society, its Officers, and Servants, will not be liable for any errors or mistakes that may happen in placing or penning the Stock or Articles to be exhibited, but the Servants in charge of the same must see that they are placed or penned according to their Entries.

13. All Servants in charge of Stock must be in attendance each day during the Show at least a quarter of an hour before the time appointed for parading the animals in the Show-rings, and must take their animals into the ring when desired by the Stewards. Any infringement of this or any other rule will render the Exhibitor liable to a fine of 1*l.* by the Stewards, and to the forfeiture by the Council of any Prize he may be entitled to.

14. The Society will not, in any case, or under any circumstances, hold itself responsible for any loss, damage, misdelivery, illness or accident that may occur *through* or *to* any Animal or Article exhibited; and it shall be a condition of entry that each Exhibitor shall hold the Society harmless, and indemnify it against any legal proceedings arising from any of the above-named circumstances.

15. Hay, straw, and green food will be delivered to the servants of Exhibitors free of expense at the Forage Stores, and they must take it to their respective Animals.

NOTE.—For the convenience of Exhibitors wishing to sell their Animals, a Register will be kept at the Secretary's Office, in which they may enter the prices.

DISQUALIFICATIONS.

16. No Animal that has competed in a Fat Stock Class in any Show shall be eligible to compete for the Prizes offered in this Prize Sheet.

17. No Animal which has taken a First Prize at any Meeting of this Society can compete again in the corresponding Class.

18. An Animal having any unsoundness likely to be transmitted to its progeny, shall be disqualified thereby from receiving any Prize offered by or through the Society.

19. If any wilful mis-statement, or misrepresentation, be proved to have been made by an Exhibitor, either in an Entry-form or otherwise, in connection with this or any Agricultural Society, the Council shall have power to withhold any Prize awarded to him, and to disqualify him from exhibiting at the Society's future Shows. (See also Regulation 5.)

PENALTIES.

20. As the non-exhibition of Animals entered for the Show causes unnecessary preparations and expense, and disarranges the Showyard, any person entering Stock, and failing to exhibit the same, shall pay a penalty of 10*s.* for each entry, or be disqualified for exhibiting in future, unless the non-exhibition be caused by the death of the Animal or Animals, illness, or unavoidable injury.

21. Every Exhibitor will be required to undertake to forfeit and pay to the Society the sum of 20*l.*, as and for liquidated damages, if the Animal or any of the Animals (as the case may be), which he exhibits, be to his knowledge suffering from any contagious or infectious disease.

22. Stock Exhibitors will receive Admission Tickets for Show for themselves and the Servants required to take charge of their Animals, and Exhibitors will be held responsible for their proper use. If a Ticket is transferred or otherwise improperly used it will be cancelled, and the Exhibitor will be required to pay a fine of 1*l.*

Awards.

23. In all cases where Prizes are awarded *conditionally*, they will be withheld until the Exhibitor shall have proved to the satisfaction of the Council that the conditions have been complied with.

24. Except under a special recommendation from the Judges, no Second Prize will be given in any of the Classes unless there are three entries, and no Third Prize unless there are eight entries, the property of not less than four Exhibitors.

25. The Certificate of the Veterinary Inspector, whether as to age or soundness, shall be required only in cases where the Judges are in doubt, or where a protest shall be delivered to the Secretary within the time prescribed by Condition No. 26. The decision of the Inspector in such cases shall be final and conclusive; and in case it shall be against the Animal to which a Prize has been awarded, such Animal shall be disqualified from receiving such Prize.

Protests.

26. Any protest must be lodged with the Secretary in the handwriting of an Exhibitor, or that of his representative, before 6 P.M. on the first day of the Exhibition, and no protest will be accepted without a deposit of 3*l.*, which sum will be forfeited at the discretion of the Stewards unless the protest is substantiated. Protests will be considered by the Disqualifying Committee, whose decision shall be final and conclusive.

APPLYING TO CERTAIN CLASSES ONLY.

Horses.

27. Horses can be removed from the Yard at night on deposit by the Exhibitor of 3*l.* at the Finance Office, which sum will be forfeited if the Horse does not return at 8 A.M. each day during the Exhibition.

28. The Stallions in Class 1 are not required to remain in the Yard longer than 6 o'clock in the evening of the third day of Show.

29. Exhibitors must provide saddles for Horses in Classes 7, 8, 9, 14, and 16, as they are to be ridden; and vehicles and harness for those in Classes 18, 19, and 20, which are to be driven.

30. No Horse, unless a Foal, will be admitted into the ring without a proper bit.

31. The Prizes for Stallions in Class 1 will be withheld until a Certificate from the owner is delivered to the Secretary that the Horse has served at least 20 Mares during the current season.

32. In Classes 4, 13, 15 and 17, Mares shall be exhibited with their own foals at foot, or shall hereafter be certified to have produced a living Foal before the 1st of August of the year of the Show.

Cattle.

33. All Bulls must have a ring or clamp attached to the nose, and in the aged Classes must be provided with a strong chain. All Cattle must be properly secured to the satisfaction of the Officers of the Society, on being brought to the gate of the Yard, or they will not be admitted.

34. All Cattle will be required to be paraded in the ring at least once a day at the discretion of the Stewards.

35. No Bull above 2 years old will be eligible for a Prize unless certified to have served not less than six different Cows (or Heifers), and it must be the sire of live calves dropped in the year 1888 or 1889.

36. No Cow will be eligible for a Prize unless certified to have had a living Calf previous to the Show, or that the Calf, if dead, was born at full time within the twelve months preceding the date of the Show.

37. In the Classes for Heifers "in-Milk or in-Calf," no Heifer entered as in-Calf will be eligible for a Prize unless she is certified to have produced a Calf born at full time before the 1st of March in the subsequent year.

38. Every Cow of the Jersey and Guernsey breeds and in the Dairy Class entered as in-Milk shall be milked dry in the Show Yard on the evening preceding the day of judging, in the presence of an officer of the Society appointed for the purpose.

39. Any Animal in the Cattle Classes found to be artificially coloured will be disqualified.

40. Any person selling Milk in the Yard without the consent of the Stewards will be fined 5*s.* for each infringement of this Regulation.

Sheep.

41. All Sheep over one year old must have been really and fairly shorn bare on or after the 1st of April in the year of the Exhibition. Inspectors will be appointed by the Council to examine Sheep on their admission to the Show-yard, with instructions to report to the Stewards any cases in which this has not been done.

42. Each pen of Ewes must be of the same Flock. No Exhibitor shall enter in the Leicester and any other Long-wool Classes from the same Flock.

Pigs.

43. The two Sow Pigs in each pen must be of the same litter.

44. All Sows farrowed before 1889 shall be certified to have had a litter of live Pigs within six months preceding the first day of exhibition, or to be in-Pig at the time of entering, so as to produce a litter of Pigs, farrowed at their proper time, before the 1st of September following. In the case of in-Pig Sows the Prize will be withheld until the Exhibitor shall have furnished the Secretary with a certificate of farrowing as above.

45. All Pigs exhibited with a Sow shall be her own produce, of the same litter, and not exceeding two months old at the time of the Show.

46. No Sow above 18 months old that has not produced a litter of live Pigs shall be eligible to compete in any of the Classes.

47. Any animal in the Pig Classes found to be artificially coloured will be disqualified.

Cheese, Butter and Cream.

48. The Cheese, Butter or Cream must in every case have been made in the Exhibitor's own Dairy by himself, his family or his servants.

49. No Exhibitor shall make more than two entries in any one class of Cheese, or more than one entry in any one class of Butter or Cream.

50. Any Cheese bored or marked will be disqualified.

51. Any distinctive mark on the Butter or its cloth which would indicate the ownership will disqualify.

52. The winners of First Prizes in the Cheese Classes will have to give one Cheese (which the Judges will select) to the Council for public disposal. The First Prize lots of Butter and Cream will be the property of the Council for public disposal. Other Exhibitors of Butter and Cream will have to give

1 lb. from each Exhibit for public tasting; and endeavour will be made to prevent damage to the Exhibits then remaining.

53. Exhibitors must very carefully answer the questions on the Entry-forms.

54. The Society cannot undertake to send back any Cheese or Butter after the Show to Exhibitors, who must make their own arrangements for its return. If Exhibitors desire it, the Society will dispose of their Cheese or Butter by auction on the afternoon of the last day of the Show, and will forward them the proceeds, less 7½ per cent. for expenses.

Butter-Making Competitions.

55. Cream will be supplied free of charge, and the Butter will be the property of the Society.

56. The Society will supply Competitors with churns, &c., or they can bring their own utensils, if they prefer to do so.

Horse-Shoeing Competition.

57. All Entries must be made on the printed forms to be obtained of the Secretary, and must reach him on or before May 22, 1889. There is no Entry Fee.

58. The competition will take place on Friday, June 7, 1889, at 10 o'clock, at which hour Competitors must attend at the Secretary's Office in the Showyard.

59. Each Competitor must make and fix a fore-shoe in the Showyard, having previously taken off the old Shoe.

60. A Competitor must bring his own Tools and a Striker, but the Society will provide Forges, Anvils, Flat Iron, Nails, and Fuel.

61. All Shoes must be fullered.

62. No Man who has already won a First Prize given by the Society for Horse-Shoeing will be eligible to compete again.

ADJUDICATION OF PRIZES.

By the Bye-Laws of the Society the Judges are instructed :—

1. Not to award any Prize or Commendation unless the animal possesses sufficient merit.
2. Not to award a Prize to any Horse or Mare, unless it is free from unsoundness likely to be transmitted to its progeny; or if a Gelding, unless free from unsoundness (an accident having temporary consequences only excepted).
3. In awarding Prizes to Cattle, Sheep, and Pigs, to decide according to the relative merits of the animals for Breeding purposes, and not to take into consideration their present value to the butcher.
4. To record the number of any animals which may in their opinion be possessed of sufficient merit to succeed to vacancies caused by disqualification. Animals so placed in a Reserved List shall, in the event of any case of disqualification, succeed to the Prize or Prizes according to the Judges' award.

Should any question arise which the Judges may desire to refer to another tribunal, the Stewards of Stock shall assist them in providing a Referee.

RAILWAY ARRANGEMENTS.

The Railway Companies agree to the following arrangements for the Conveyance of Stock to and from the Show:—

1. Stock to be charged full rates to the Show, but half rates on the return journey at owner's risk if unsold, and on production of a Certificate to that effect from the Secretary of the Society. The reduction to half rate is allowed only when the Stock is returned to the same station as that from which it was conveyed to the Show and by the same route.

2. Men certified by the Exhibitor to be *bonâ fide* in charge of Stock to be conveyed free, providing that they travel in the same train as the Animals; the number not to exceed one man to each vehicle.

3. The foregoing regulations to apply to Animals whether carried in horse boxes by passenger or special train, or in cattle trucks by luggage trains. The concession as to Animals in horse boxes is granted only on the condition that the present orders of the Privy Council, under which the Companies are not required to disinfect horse boxes, remain in force. If the unsold Stock, which was conveyed on the Outward Journey by Goods Train in Cattle Trucks, be required to be returned by Passenger Train in Horse Boxes, half the Passenger rates will be charged, and *vice versâ.*

In accordance with a recent arrangement, the Railway Companies will provide specially constructed covered Cattle Trucks at a reduced rate of charge, further proportionate reduction being made when more than one Animal is carried.

To insure prompt delivery of Stock, Exhibitors are recommended to ascertain the *proper time for loading* from the Superintendent or Booking Clerk at the Station from which their Stock is intended to be despatched.

Bath and West of England Society

(ESTABLISHED 1777,)

AND

Southern Counties Association,

FOR THE

Encouragement of Agriculture, Arts, Manufactures, and Commerce.

Patron:

HIS ROYAL HIGHNESS THE PRINCE OF WALES, K.G.

President for 1888–9:

THE RT. HON. THE LORD CLINTON.

PRIZES

OFFERED FOR

POULTRY,

AT THE SOCIETY'S EXHIBITION AT

EXETER,

ON

WEDNESDAY, THURSDAY, FRIDAY, SATURDAY, AND MONDAY, JUNE 5, 6, 7, 8, AND 10, 1889.

N.B.—All Forms of Entry for Poultry must be returned, properly filled up, to the Secretary, THOS. F. PLOWMAN, 4, Terrace Walk, Bath, with the Fees due, on or before

MAY 8,

or no Notice will be taken of them.

PRIZES FOR POULTRY.

N.B.—*All Forms of Entry must be properly filled up, signed and returned to the Secretary with the Fees, on or before May 8th,* 1889.

	First Prize.	Second Prize.	Third Prize.
Section 1.—GENERALLY USEFUL BREEDS.	£ s.	s. d.	s.
CLASS			
1.—COCHINS (Cinnamon and Buff)—Cock	1 10	15 0	5
2.—Ditto—Hen	1 10	15 0	5
3.—COCHINS (Partridge-Feathered or White)—Cock .	1 10	15 0	5
4.—Ditto—Hen	1 10	15 0	5
5.—BRAHMAS (Dark)—Cock	1 10	15 0	5
6.—Ditto—Hen	1 10	15 0	5
7.—BRAHMAS (Light)—Cock	1 10	15 0	5
8.—Ditto—Hen	1 10	15 0	5
9.—LANGSHANS—Cock	1 10	15 0	5
10.—Ditto—Hen	1 10	15 0	5
11.—PLYMOUTH ROCKS—Cock	1 10	15 0	5
12.—Ditto—Hen	1 10	15 0	5
13.—WYANDOTTE—Cock	1 10	15 0	5
14.—Ditto—Hen	1 10	15 0	5
15.—CHICKENS OF 1888 (Cochin, Brahma, Langshan, Plymouth Rock, or Wyandotte)—Cockerel . .	1 10	15 0	5
16.—Ditto—Pullet	1 10	15 0	5
Section 2.—LAYING OR NON-SETTING BREEDS.			
17.—SPANISH—Cock	1 10	15 0	5
18.—Ditto—Hen	1 10	15 0	5
19.—MINORCAS—Cock	1 10	15 0	5
20.—Ditto—Hen	1 10	15 0	5
21.—LEGHORNS (Any Variety)—Cock	1 10	15 0	5
22.—Ditto—Hen	1 10	15 0	5
23.—HOUDANS—Cock	1 10	15 0	5
24.—Ditto—Hen	1 10	15 0	5
25.—POLISH FOWL—Cock	1 10	15 0	5
26.—Ditto—Hen	1 10	15 0	5
27.—HAMBURGS (Golden Spangled)—Cock . . .	1 10	15 0	5
28.—Ditto—Hen	1 10	15 0	5
29.—HAMBURGS (Silver Spangled)—Cock . . .	1 10	15 0	5
30.—Ditto—Hen	1 10	15 0	5
31.—HAMBURGS (Golden Pencilled)—Cock . . .	1 10	15 0	5
32.—Ditto—Hen	1 10	15 0	5
33.—HAMBURGS (Silver Pencilled)—Cock . . .	1 10	15 0	5
34.—Ditto—Hen	1 10	15 0	5
35.—HAMBURGS (Black)—Cock	1 10	15 0	5
36.—Ditto—Hen	1 10	15 0	5
37.—CHICKENS OF 1888 (Spanish, Minorca, Leghorn, Houdan, Polish, or Hamburg)—Cockerel . . .	1 10	15 0	5
38.—Ditto—Pullet	1 10	15 0	5

Section 3.—BREEDS SUITABLE FOR THE TABLE.

Class	First Prize. £ s.	Second Prize. s. d.	Third Prize. s.
39.—Dorkings (Coloured)—Cock	1 10	15 0	5
40.—Ditto—Hen	1 10	15 0	5
41.—Dorkings (Silver Grey)—Cock	1 10	15 0	5
42.—Ditto—Hen	1 10	15 0	5
43.—Dorkings (White or Cuckoo)—Cock	1 10	15 0	5
44.—Ditto—Hen	1 10	15 0	5
45.—Game (Black-Breasted Reds)—Cock	1 10	15 0	5
46.—Ditto—Hen	1 10	15 0	5
47.—Game (Brown-Breasted Reds)—Cock	1 10	15 0	5
48.—Ditto—Hen	1 10	15 0	5
49.—Game (Pile or any other Variety)—Cock	1 10	15 0	5
50.—Ditto—Hen	1 10	15 0	5
51.—Malays—Cock	1 10	15 0	5
52.—Ditto—Hen	1 10	15 0	5
53.—Indian Game—Cock	1 10	15 0	5
54.—Ditto—Hen	1 10	15 0	5
55.—Any other Distinct Variety not Mentioned— Cock	1 10	15 0	5
56.—Ditto—Hen	1 10	15 0	5
57.—Chickens of 1888 (Dorking, Game, Malay, Indian	1 10	15 0	5
Game, or any other Variety not mentioned)—	1 10	15 0	5
Cockerel	1 10	15 0	5
58.—Ditto—Pullet	1 10	15 0	5
59.—Chickens of 1889 (either pure-bred or cross-bred)— Two Cockerels. *The 1st Prize, given by the Proprietors of the 'Field' newspaper, is a Silver Cup . . . . . value*	3 0	20 0	10
60.—Chickens of 1889 (either pure-bred or cross-bred)— Two Pullets. *The 1st Prize, given by W. B. Tegetmeier, Esq., is a Silver Cup . . . . . value*	3 0	20 0	10

Section 4.—DUCKS, GEESE AND TURKEYS.

Class	First Prize. £ s.	Second Prize. s. d.	Third Prize. s.
61.—Drake or Duck (Rouen or Aylesbury)	1 10	15 0	5
62.—Ditto (Pekin)	1 10	15 0	5
63.—Couple of Ducklings—(Pure or Cross Bred Variety)	1 10	15 0	5
64.—Gander or Goose (any Variety)	1 10	15 0	5
65.—Turkeys—Cock or Hen	1 10	15 0	5

Section 5.—FANCY BREEDS.

Class	First Prize. £ s.	Second Prize. s. d.	Third Prize. s.
66.—Bantams (Black or White)—Cock	1 0	10 0	5
67.—Ditto—Hen	1 0	10 0	5
68.—Bantams (Game, any Variety)—Cock	1 0	10 0	5
69.—Ditto—Hen	1 0	10 0	5
70.—Bantams (any other distinct Variety)—Cock	1 0	10 0	5
71.—Ditto—Hen	1 0	10 0	5

POULTRY.

CONDITIONS AND REGULATIONS.

CHARGES, &C.

1. Exhibitors may make an unlimited number of Entries in each Class on payment of fees as follows:—

Classes 1 to 65 inclusive	5*s.* per entry.
Classes 66 to 71 inclusive	3*s.* per entry.

The above fees include coops, food, and attendance.

N.B.—The above Fees *must* be sent with the Entries, or no notice will be taken of the latter.

2. All entries must be made on the printed forms, to be obtained of the Secretary, (THOMAS F. PLOWMAN, 4, Terrace Walk, Bath), and such forms must be correctly filled up and returned to the Secretary, together with all fees due, on or before May 8th. Exhibitors are requested to carefully examine the List of Prizes and Conditions, as the Society cannot be responsible for any errors made by Exhibitors in the Entry forms, and birds entered in a wrong Class will be necessarily excluded from competition. No alterations can be made in Entry forms after they have been received by the Secretary.

3. The Council reserve the right to refuse the entries of any person.

4. Exhibitors must state the price, breed, and age of their birds on their Entry forms.

SHOWYARD.

5. All birds must be at the Showyard *on Tuesday, June 4th,* and no bird can be removed before Monday, June 10th, at 7 P.M.

6. All carriage must be pre-paid to Exeter Railway Station, otherwise the birds will not be received at the Exhibition; but they will be conveyed free of expense from the Station to the Showyard and back.

7. No Exhibitor or Servant will be allowed into the Tent until the Birds have been judged.

8. The Poultry Tent will not be open to the public until 2 o'clock on the 1st day of the Exhibition.

9. One admission ticket to the Show, available whenever the Show is open to the public, will be given to each Exhibitor whose Entry-Fees amount to 1*l.* and upwards.

TABLE POULTRY.

10. In Classes 59 and 60, quality for the table will be considered before mere weight. The date of hatching must be given, and, in the case of cross-bred birds, the breeds of the parents.

SALES.

11. All birds may be claimed at the price put upon them, any time after 4 o'clock on Wednesday, June 5th, and a sale *must take place* if the price stated be paid to the Clerk in the Poultry Office at the time of claiming. *No alteration can be made in the prices stated on the Entry Forms* and in the Catalogue until after Friday, June 7th, when the price may be reduced on payment to the Stewards of 1*s.* per Pen on each alteration. Birds must be *sold in pens,* and the price stated must include the basket. A charge of 10 per cent. will be made for all birds sold. The persons who have the management of the sales cannot take charge of birds which are disposed of privately.

Disqualifications.

12. The Judges are empowered to withhold a prize or prizes where birds are considered of sufficient merit, or to disqualify any that have been clipped, dr trimmed, marked, or dyed, and an Exhibitor detected in a false statement as t age, &c., of any bird, or in any other practice calculated to deceive or mislea Judges or Stewards shall forfeit all or any prizes awarded to him or her at Show, and will be disqualified from competing at any future Show of the Society

13. Unhealthy birds will not be exhibited, but will be immediately returne their owners, and the fees forfeited.

Protests.

14. In order to check frivolous and vexatious protests, no protest will be entert unless accompanied by a deposit of 1*l.* in each case; and in case the protest i substantiated, the deposit may be forfeited to the funds of the Society. All pr must be made before 12 o'clock (noon) on Thursday, June 6th.

Forfeits.

15. Persons entering birds, and failing to send the same to the Exhibition, forfeit the entrance fee for each pen so left vacant.

General.

16. All birds shown must be *bonâ fide* the property of the Exhibitor.

17. For each pen entered, the Exhibitor will receive a Label, on the reverse si which he must legibly write his name and address for the return journey.

18. All Eggs laid at the Exhibition will be destroyed.

19. The Stewards pledge themselves to take every care of the birds exhibited neither they nor the Society will in any case be responsible for any accident, lo damage, from whatever cause arising, the exhibits being entered at the sole risk o Exhibitors, and Exhibitors will be required to hold the Society harmless in event of loss.

20. In case of death of any bird during the Exhibition, it will be sent back fo inspection of the Exhibitor.

21. The Poultry Department is subject to the rules and regulations of the So and its officers.

*** *The use of properly-constructed poultry baskets will facilitate the safe and s conveyance of the specimens to and from the Exhibition.*

The Society cannot, under any circumstances, undertake to send telegran Exhibitors as to Judges' awards.

Applications for Catalogues and printed lists of awards should be made t Publishers, Messrs. Lewis and Sons, *Herald Office, Bath.*

By Order of the Council,

THOMAS F. PLOWMAN, Secretary,

4, *Terrace Walk, Bat*

EXETER MEETING,

COMMENCING ON WEDNESDAY, JUNE 5, AND TERMINATING ON MONDAY, JUNE 10, 1889.

REGULATIONS

FOR THE EXHIBITION OF

IMPLEMENTS, MACHINERY, SEEDS, CATTLE FOODS, ARTIFICIAL MANURES, FARM PRODUCE,

AND

MISCELLANEOUS ARTICLES.

CHARGES, &c.

1. All Entries, together with all amounts due, must reach th Secretary on or before Saturday, March 28th, 1889, but the Society' arrangements will be facilitated by their receipt previous to thi date. All Entries are received subject to approval by the Counci of the Society, and must be made on the authorised forms, to b obtained of the Secretary.

2. Every Exhibitor, not being a Member of the Society, sub scribing at least 1*l.* annually, will be required to pay an Entry-fe of 10*s.*, in addition to the charge for Space, in accordance with th following rates:—

	£	s.	d
Special Shedding, for Machinery worked by steam, gas, electricity, or horse power. For each compartment (20 feet deep, 14 feet wide, and 10 feet high at the eaves)	3	15	
Ditto, ditto, with space for elevator behind	4	0	

The above charges include the cost of a special frame work provided by the Society for Exhibitors' names. (See Regulation 7.)

No charge will be made for space in front of the "Special" Shedding required for the Engine employed to drive the Machines placed therein; but if space is required for Machinery, other than Elevators, behind the Special Shedding, it must be applied for, and if available will be allotted and charged at 1*s.* per square yard.

Exhibitors requiring a greater height than 10 feet must make special application.

	£	s.	d.
Ordinary Shedding, for such Implements and Machines *only* as are strictly Agricultural in their character, 20 feet deep, and 7 feet high at the eaves (not less than 10 feet run will be allotted, but after that it can be taken in lengths of 5 feet each), at per foot run	0	2	0
N.B.—Exhibitors under O.S. who desire to exhibit also under M.S. can have 10 feet or more of the latter annexed to their O.S.			
Seed Shedding, 18 feet deep, and 8 feet 6 inches high at the eaves (not less than 10 feet run will be allotted), at per foot run ..	0	5	0
Hoarding Shedding, for Cattle Foods, Cattle Medicines, Artificial Manures, and Farm Produce, 18 feet deep, and 8 feet high at the eaves (not less than 10 feet run will be allotted), at per foot run	0	7	6
Miscellaneous Shedding, for Carriages, Horticultural Implements, and all other Articles *not strictly Agricultural in their character*, 20 feet deep, and 7 feet high at the eaves (not less than 10 feet run will be allotted, but after that it can be taken in lengths of 5 feet each), at per foot run	0	7	6
Uncovered Ground for buildings (but nothing to be exhibited under them) and articles too high to go under Shedding (not less than 180 square feet will be allotted), at per square yard ..	0	0	2

3. A charge of 6*d.* per line is made for inserting in the published Catalogue the descriptions of their goods given by Exhibitors on the Specification Forms. Ten words count as one ordinary line; but any portion of a line which finishes a description must be counted as one line. A fresh line must be begun in describing each article, and no line must be reckoned at less than 6*d.* Two numerals count as one word. This charge must be paid to the Secretary with the other fees and charges at the time of making the entry.

SHOWYARD.

4. The Yard will be open for the reception of Articles intended for Exhibition from 7 A.M. to 6 P.M. on Saturday, May 25th, and following days, up to and including Tuesday, June 4th.

5. Every Implement or other Article when presented at the gate of the Showyard must have on it a Label bearing in legible characters the name of the Exhibitor, the number of his Shed and Stand, and the number of the Article. Exhibitors must state on their Entry Forms the number of labels required, and they will then be supplied by the Secretary. Articles not so labelled will be refused admission.

All Articles must be arranged in the Sheds so that they may be seen from the space between the shedding. No article will be allowed to project or be placed outside any but the Special Shedding.

[illegible] the Special Shedding it has been arranged, for the sake of [illegible] prominence and to allow room for the straps from the engines, that Exhibitors' names shall be placed above the level of the eaves, and 3 feet in advance of them. A special frame-work [illegible] feet deep will be provided (without further charge) by the Society for this purpose. The names provided by the Exhibitors

may be of any colour and material, but must be of the uniform depth of 3 feet.

8. No signs are to be fixed at the ends of the sheds so as to project beyond the Exhibitors' frontage, or the slope of the gable, nor are any to be fixed on the ridge of the sheds. Exhibitors must not close the ends or any part of their shedding by boards or otherwise.

9. Any Exhibitor damaging the shedding or canvas, either by forcing any Article of more than 7 feet in height under it, or by any other means, will incur a penalty of 40*s.*, and the Stewards shall have power to remove his Exhibits from the Yard.

10. If flag-poles are used they must not be placed more than one foot from the Shedding or be attached to any part of it.

11. No fire, except gas, will be allowed under Shedding of any description.

12. Exhibitors requiring gas must make their own arrangements for its supply.

13. Coke or Anthracite Coal will alone be allowed as Fuel, and this must be bought in the Yard from the Coal Contractor appointed by the Society.

14. Any Article on which the paint or varnish is not perfectly dry by 8 o'clock on the first morning of the Exhibition shall be removed at once from the Yard at the cost of the Exhibitor, and a penalty of 20*s.* will be incurred for every such article.

15. Exhibitors must provide, at their own cost, whatever they may require for exhibiting their Machines in motion in the Yard.

16. Exhibitors will not be allowed to bring any vehicle into the Yard after 9 A.M. during the days of Exhibition.

17. Exhibitors will be required to furnish to customers giving orders in the Yard the articles exhibited by them, and also others of equal quality, material, and manufacture, ordered at the Exhibition, at prices not exceeding those entered in their specifications.

18. Exhibitors subletting any portion of the space allotted to them shall be subject to a penalty of 40*s.*; and shall, with the person hiring the same, be expelled from the Yard.

19. No Exhibitor will be permitted to exhibit, sell, or offer for sale, any article except at the Stand allotted to him, and there only the articles he has entered on his Specification Form.

20. No Exhibitor or other person will be allowed to affix any placard or advertisement to any part of the Society's plant or premises, nor will any person be allowed to distribute handbills except in his own Stand.

21. The Stewards shall have power to expel from the Yard any

Exhibitor or his representative who shall call attention to his goods in a manner as to cause annoyance.

22. The Society will supply, in accordance with a scale of charges to be obtained of the Secretary, such fittings, &c., as may be required by Exhibitors at their Stands, provided notice is given to the Steward of Works, at the Showyard, at least one week previous to the opening of the Exhibition to the public, such fittings, &c., remaining the property of the Society after the Exhibition. Only the Society's workman or materials will be allowed in the Showyard, except under special arrangement with the Steward of Works.

23. No Article will be permitted to be removed from the Exhibition till Tuesday, June 11th.

24. Tickets of admission to the Exhibition, each being available for either a Member of the Exhibitor's Firm or any one employed by it, will be forwarded to Exhibitors from the Secretary's Office in the proportion stated below. No Tickets in excess of this number will be issued under any circumstances, except in the case of a Member of the Society, who will receive his usual Member's Ticket in addition. An Exhibitor will be held responsible for their proper use. If a Ticket is transferred or otherwise improperly used it will be cancelled, and the Exhibitor will be required to pay a fine of 1*l*.

SPECIAL SHEDDING.

4 Tickets if 1 compartment is taken.
6 " 2 compartments are taken.
8 " 3 " "

ORDINARY, SEED, HOARDING, AND MISCELLANEOUS SHEDDING.

3 Tickets if 10 feet are taken.
5 " 20 " "
6 " 30 " "
7 " 40 " "
8 " 50 " "
9 " 60 " "
10 " 70 and upwards.

UNCOVERED GROUND.

3 Tickets if 120 square feet are taken.
4 " 270 " "
5 " 450 " "
6 " 630 " "
8 " 900 and upwards.

25. No Badges are allowed to be worn in the Showyard, except the official Badges of the Society.

26. Exhibitors' Servants working in the Yard will be admitted without Tickets up to and (with the exception of Sunday) including the day previous to the opening of the Exhibition, provided they are accompanied by, or produce a written authority from, an Exhibitor or his Representative, to whom an Admission Ticket has been issued.

. All persons and articles entering the Exhibition will be subject to the Orders, Rules, and Regulations of the Council, and of the officers appointed by them.

28. The Council of the Society will not be in any way responsible with regard to any article entered or exhibited; and it shall be a condition of entry that each Exhibitor shall hold the Society harmless and indemnify it against any legal proceedings that may arise from the loss, damage, or misdelivery of any article.

29. All fines, fees, and charges shall be recoverable by the Secretary.

FIELD EXHIBITION.

No suitable land sufficiently near the Showyard being available at Exeter, the usual Trials of Implements in the Field will be suspended for this year.

By Order of the Council,

THOMAS F. PLOWMAN, Secretary,

4, *Terrace Walk, Bath.*

Railway Arrangements.

Implements, &c., are subject to the usual full charges for carriage, both going to and returning from the Exhibition, excepting only such Implements of Husbandry as remain unsold, and are returned by goods trains to the stations whence sent, AT OWNER'S RISK. These will be charged half rates on the return journey—provided they are returned by the same route as that by which they went to the Exhibition—upon production of a Certificate from the Secretary that they are really unsold.

To insure prompt delivery, Exhibitors are recommended to ascertain the *proper time for loading* from the Superintendent or Booking Clerk at the Station from which their Implements are intended to be despatched.

Bath and West of England Society

(ESTABLISHED 1777,)

AND

Southern Counties Association,

FOR THE

Encouragement of Agriculture, Arts, Manufactures, and Commerce.

PATRON.—H.R.H. THE PRINCE OF WALES, K.G.

PRESIDENT FOR 1888-9.—THE RT. HON. THE LORD CLINTON.

EXETER MEETING, 1889.

COMMENCING WEDNESDAY, JUNE 5; TERMINATING MONDAY, JUNE 10.

HORTICULTURAL DEPARTMENT.

IN requesting your assistance for the above Society's Exhibition at Exeter, by the loan of plants, &c., the Steward of the Horticultural Department begs to state that, in order to obviate the objections so often made against the system of exhibiting plants in competition for Money Prizes, it has been determined to give sums of money, in proportion to the importance and value of the plants exhibited, as gratuities to Exhibitors' gardeners, &c.

Exhibitors are requested to forward to the Steward, before May 22, 1889, a description of the plants proposed to be shown.

All plants must be staged in their allotted places on Tuesday, June 4, or not later than 10 A.M. on Wednesday, June 5.

Plants may be changed during the Exhibition, but must not be removed between the hours of 10 A.M. and 6 P.M. On the last day of the Exhibition they may be removed from the Show Ground at 6 P.M.

If Gardeners are unable to water their own plants, the Steward will direct his foreman to attend to them.

N.B.—The tent in which the plants will be exhibited is closed with glass ends and well ventilated, so as to afford perfect security to the most delicate flowers.

Any further information may be obtained on application to the Steward, the Hon. and Rev. J. T. BOSCAWEN, F.L.S., Lamorran, Probus, Cornwall.

Bath and West of England Society
(ESTABLISHED 1777,)

AND

Southern Counties Association,

FOR THE

Encouragement of Agriculture, Arts, Manufactures, and Commerce.

PATRON—H.R.H. THE PRINCE OF WALES, K.G.

THE SOCIETY'S ORIGIN AND OPERATIONS.

THE Society was originally established in the City of Bath, on September 8th, 1777, "for the Encouragement of Agriculture, Manufactures, Commerce, and the Fine Arts," and the founders of the Society were among the first to promote a systematic co-operation between the tillers of the soil and the cultivators of science, art, and literature, whilst they also recognized the intimate connection between agriculture, manufactures, and commerce.

In 1852 the Society, without losing its identity, became itinerant, and consequently more comprehensive. It availed itself of the modern means of communication and locomotion, and extended its operations to the Western Counties generally. The success which attended it induced a number of noblemen and gentlemen of influence in the Southern Counties to start a similar Society for the Counties of Kent, Sussex, Surrey, Hampshire, Berkshire, and Oxfordshire. The implement makers, however, very strongly deprecated the existence of another large agricultural association, and, as the result of a negociation between the leading representatives of the Western and Southern Societies, held in 1866, a union of the two bodies was effected, and the Society has since continued to exist as the Bath and West of England Society and Southern Counties Association. This union has had the effect of securing for the whole of the South and West of England at least one good and complete exhibition of agricultural produce and machinery in every year.

Terms and Privileges of Membership.

A Subscriber of 1*l.* annually is a Member entitled to all the privileges of the Society, but tenant-farmers, the rateable value of whose holdings does not exceed 200*l.* a-year, can become Members on subscribing 10*s.* annually. All Members are entitled:—

1. To receive the Society's 'Journal' free of expense.
2. To obtain opinions and analyses with regard to Manures, Soils, Feeding Stuffs, &c., at very low rates.
3. To obtain reports and results of examinations of Seeds and Plants at very low rates. (See p. lxxix).

Members subscribing 1*l.* annually are, in addition to the above-named privileges, entitled:—

4. To make an unlimited number of Stock and Implement Entries at the Society's Annual Exhibitions at reduced fees.

Admission to Exhibitions.

5. Members subscribing less than 1*l.* annually are admitted free to the Society's Exhibitions and to the Reserved Seats in the Grand Stand, the Working Dairy, and the Band Enclosure for *one day* only, but Members subscribing 1*l.* annually are admitted free during *the whole time* of the Annual Show.

The payment of 10*l.* in one sum constitutes a Member for life.

A Member subscribing 2*l.* annually is a Governor and eligible for election as a Vice-President. In addition to all the above-mentioned privileges, he is entitled:—

6. To nominate one friend to the Society's Exhibitions and to the Reserved Seats in the Grand Stand, the Working Dairy, and the Band Enclosure during *the whole time* of the Annual Show, and another friend for every further pound subscribed.

The payment of 20*l.* in one sum constitutes a Governor for life.

The Society's Journal.

The *Journal*, which is published annually, has for its aim the dissemination of Agricultural knowledge in a popular form, and affords a medium for recording and discussing the chief topics of interest in this direction which have been ventilated

during the year. In addition to original papers by well-known authorities on the subjects with which they deal, it contains Reports on the Live-Stock, Implements, &c., exhibited at the Society's Shows, together with other particulars of the Society's operations.

Chemical Analyses.

Special arrangements are made by which Members can obtain at reduced rates of charge (particulars of which are given on p. lxxx) opinions and analyses with regard to Manures, Soils, Feeding Stuffs, Animal Products, Water, &c., from the Society's Consulting Chemist, Dr. J. A. Voelcker, B.A., B.Sc.; F.C.S., who can be consulted either personally or by letter.

Botanical Examinations.

Special arrangements are also made by which Members can have Seeds and Plants reported on by the Society's Consulting Botanist, Mr. W. Carruthers, F.R.S., at the rates stated on p. lxxix.

The Annual Exhibitions.

Prizes to a large amount are annually given for agricultural stock, cheese, butter, poultry, &c., whilst the support accorded to the Society by the most important agricultural implement firms of the kingdom has, for some years past, enabled it to make their department a distinguishing feature of the annual exhibitions. Provision is also made for the exhibition of machinery, seeds, feeding stuffs, artificial manures, &c.

The development of the purposes of the annual exhibition by including fine arts, decorative art, local manufactures, horticulture, and music, has given to the Society a comprehensive and attractive character, which, while it materially adds to the social benefits conferred, tends indirectly to promote the funds available for the primary purposes of the Society. Particulars of the various departments of the annual exhibition and of the prizes offered can be obtained of the Secretary, 4, Terrace Walk, Bath.

The Arts and Manufactures Departments.

The chief objects the Society has in view in maintaining these departments are—1st—The cultivation of the love of the beautiful among the class of persons who visit such exhibitions as that in its Agricultural Show Yard; 2nd.—The encouragement of young artists, especially, and of local efforts to produce beautiful things, both among artists and manufacturers of decorative or useful articles; 3rd.—The exhibition of such art

treasures as there may be in private or other collections in the neighbourhood or town where the exhibition is held, to which the public ordinarily have no access. The works of amateurs, if of merit, are accepted on loan or for sale at the annual exhibition, and in connection with it an Art Union for pictures is held under the regulations of the Board of Trade.

Dairying.

A Working Dairy is a special feature of the Annual Exhibition, in which explanatory lectures and demonstrations with reference to every branch of Dairy Husbandry are given; various dairying operations and the implements employed in them are tested and compared; and Butter-making Competitions for farmers' wives and daughters, and dairy men and maids, are carried on.

Arrangements have also been made for the establishment of itinerant Dairy Schools in such districts within the area embraced by the Society as may desire them, for the purpose of teaching the best methods of buttter-making. Four of these Schools have already been opened, in which courses of instruction have been successfully carried out.

The Experimental Department.

The work of this Department is being carried out under the direction of a Special Committee, who are conducting experiments in various parts of the kingdom, the results of which are published in the Society's 'Journal.' The special objects of the Department are:—

(*a.*) To test the advantages, or otherwise, of the use of artificial manures, on corn and grass, on land in ordinary farming condition, based on the results obtained from the Rothamsted and Woburn Experiments.

(*b.*) To examine, test, and exhibit, any new processes for dealing with Agricultural produce which appear likely to be beneficial.

(*c.*) To collect and publish information on new systems of cultivation, routine of crops, or other efforts which are being made for the profitable cultivation of land under probable low prices of corn.

Any persons desirous of joining the Society can be proposed by a Member or by the Secretary (Thos. F. Plowman, 4, Terrace Walk, Bath).

Member's Botanical Privileges.

The Council have arranged for the following rates of charge for the examination, by the Society's Consulting Botanist, of Plants and Seeds for the *bonâ fide* and individual information and benefit of Members of the Society (not being seedsmen). The charge for examination must be paid at the time of application, and the carriage of all parcels must be prepaid.

No.		
1.—	A report on the purity and germinating power of a sample of seed, stating the sorts and amount of any other seeds found therein ..	1*s.*
2.—	Determination of the species of any weed or other plant, or of any epiphyte or vegetable parasite, with a report on its habits, and the means for its extermination or prevention	1*s.*
3.—	Report on any disease affecting farm crops	1*s.*
4.—	Determination of the species of a collection of natural grasses found in any district, with a report on their habits and pasture value ..	5*s.*

N.B.—The Consulting Botanist's Reports on Seeds are furnished to enable Members,—purchasers of seeds and corn for Agricultural or Horticultural purposes,—to test the value of what they buy, and are not to be used or made available for advertising or trade purposes.

PURCHASE OF SEEDS.

The purchaser should obtain from the vendor, by invoice or otherwise, a proper designation of the seed he buys, with a guarantee that it contains not more than a specified amount of other seeds, and is free from ergot, or, in the case of clovers, from dodder, and of the percentage of seeds that will germinate.

The germination of cereals, green crops, clover, and timothy grass should be not less than 90 per cent.; of fox-tail not less than 60 per cent.; of other grasses not less than 70 per cent.

The Council strongly recommend that the purchase of prepared mixtures should be avoided, and that the different seeds to be shown should be purchased separately.

INSTRUCTIONS FOR SELECTING AND SENDING SAMPLES.

I. Seeds.

In sending seed or corn for examination the utmost care must be taken to secure a fair and honest sample. In the case of grass-seeds the sample should be drawn from the centre of the sack or bag, and in all cases from the bulk delivered to the purchaser and not from the purchase sample. When bought by sample, the whole or part of that sample should also be sent.

When it is considered necessary to secure legal evidence, the sample should be taken from the bulk and placed in a sealed bag in the presence of a reliable witness who is acquainted with the identity of the bulk, and care should be taken that the purchased sample and bulk be not tampered with after delivery, or mixed or come in contact with any other sample or stock.

One ounce of grass and other small seeds should be sent, and two ounces of cereals or larger seeds. The exact name under which the seed has been bought should be sent with it.

Grass-seeds should be sent at least FOUR WEEKS, *and clover-seeds* TWO WEEKS *before they are required, and they should not be sown until the report has been received.*

II. Plants.

In collecting specimens of plants, the whole plant should be taken up, and the earth shaken from the roots. If possible, the plants must be in flower or fruit. They should be packed in a light box, or in a firm paper parcel.

Specimens of diseased plants or of parasites should be forwarded as fresh as possible. They should be placed in a bottle, or packed in tinfoil or oil-silk.

All specimens should be accompanied with a letter specifying the nature of the information required, and stating any local circumstances (soil, situation, &c.) which, in the opinion of the sender, would be likely to throw light on the inquiry.

Parcels or letters containing seeds or plants for examination (carriage or postage prepaid) must be addressed to Mr. W. Carruthers, F.R.S., 44, Central Hill, Norwood, London, S.E.

treasures, as there may be in private or other collections in the neighbourhood or town where the exhibition is held, to which the public ordinarily have no access. The works of amateurs, [illegible] are accepted for loan or for sale at the annual exhibition, and in connection with it an Art Union for pictures is held under the regulations of the Board of Trade.

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Arrangements have also been made for the establishment of Itinerant Dairy Schools in such districts within the area embraced by the Society as may desire them, for the purpose of teaching the best methods of butter-making. Four of these Schools have already been opened, in which courses of instruction have been successfully carried out.

The Experimental Department.

The work of this Department is being carried out under the direction of a Special Committee, who are conducting experiments in various parts of the kingdom, the results of which are published in the Society's Journal. The special objects of the Department are:—

(a) To test the advantages, or otherwise, of the use of artificial manures for corn and grass on land in ordinary farming condition, based on the results obtained from the Rothamsted and Woburn Experiments.

(b) To examine, test, and exhibit any new processes for dealing with Agricultural produce which appear likely to be beneficial.

(c) To collect and publish information on new systems of cultivation, routine of crops, or other efforts which are being made for the profitable cultivation of land under probable low prices of corn.

[illegible] joining the Society can be proposed [illegible]

[illegible] Secretary, THOS. F. PLOWMAN.

The Bath and West of England Society

SUMMARY OF THE CASH ACCOUNT

DR. WITH COMPARATIVE

RECEIPTS.	£ s. d.	£ s. d.	1888. Newport. £ s. d.	1887. Dorchester. £ s. d.
BALANCE BROUGHT FORWARD, JAN. 1, 1888		..	129 5 1	1,083 4 7
General Receipts:—				
Dividends and Bonus		646 1 2		481 0 11
Subscriptions from Members		954 1 0		1,019 16 0
Ditto, paid in advance		..		10 11 0
Life Compositions		100 0 0		90 0 0
Journal		12 18 11		4 13 10
			1,713 1 1	1,606 1 9
Show Receipts:—				
Implements (Yard)		1,688 15 3		1,317 13 10
" (Field)		..		14 10 0
				1,332 3 10
Horses	289 2 0			294 9 0
Cattle, Sheep, and Pigs	351 15 6			427 15 0
Catalogues, &c.	142 19 11			132 2 7
		783 17 5		764 6 7
Poultry		103 12 2		128 14 3
Arts No. 1.	8 0 5			14 9 2
Art Union	114 8 0			82 10 0
Art-Manufactures	121 6 0			51 0 0
		243 14 5		147 19 2
Workmen's Exhibition		25 0 0		..
Music		11 7 0		6 10 8
Cheese and Butter		61 6 11		103 7 3
Working Dairy		113 7 0		57 17 9
Plant		..		48 18 3
Refreshment Contracts		370 0 0		294 0 0
Admissions		3,725 18 6		2,522 10 6
Unapportionable:—				
Cloak Rooms, &c.	32 10 6			47 10 0
Exhibitors for Stand Fittings.	283 15 9			272 5 0
		316 6 3		319 15 0
Subscription from Exeter for 1889 Show		800 0 0		800 0 0
			8,243 4 11	6,526 3 3
*Dairy Schools		..	213 15 7	
		£	10,299 6 8	9,215 9 7

* There are also outstanding accounts, due to the Society for School fees, &c., amounting to £16 9s. 8d.

and Southern Counties Association.

FOR THE YEAR ENDING DEC. 31st, 1888,

STATEMENT FOR 1887. **Cr.**

PAYMENTS.			1888. Newport.	1887. Dorchester.
		£ s. d.	£ s. d.	£ s. d.
General Expenses:—				
Salaries		775 0 0		675 0 6
Rent, Postage, Stationery, &c.		221 5 2		223 1 4
Journal		515 8 7		527 12 9
			1,511 13 9	1,425 14 1
Show Expenses:—	£ s. d.			
Implements (Yard)		525 4 4		573 1 0
Do. (Field)				125 0 10
				698 1 10
Horses	761 19 4			716 7 3
Cattle, Sheep, and Pigs	2,076 12 11			2,060 15 4
Fodder, &c.	484 14 3			418 8 2
		3,323 6 6		3,195 10 9
Poultry		287 0 7		333 16 3
Horse Shoeing		23 9 10		20 6 10
Arts No. 1.	274 15 1			288 15 10
Art Union	213 10 2			179 17 11
Art-Manufactures	51 10 2			43 0 11
		539 15 5		511 14 8
Workmen's Exhibition		35 19 4		..
Music		298 8 7		253 4 4
Horticulture		206 19 8		215 17 6
Cheese and Butter		168 6 7		217 15 4
Working Dairy		293 14 2		280 17 0
Bees		..		10 0 0
Public Announcements		473 17 1		516 3 0
Refreshment Contracts		54 12 9		52 8 9
Unapportionable:—	£ s. d.			
Cost of Exhibitors' Stand Fittings	243 13 9			232 5 11
Erection of Offices, &c.	302 17 6			380 19 4
Carriage of Plant	84 5 7			103 7 0
Police	148 7 10			74 8 4
Miscellaneous	334 0 4			293 8 1
		1,113 5 0		1,084 8 8
			7,343 19 10	7,390 4 11
Experiments		..	229 4 2	270 5 6
*Dairy Schools		..	193 11 11	..
			9,278 9 8	9,086 4 6
Balance in Bank		..	1,020 17 0	129 5 1
			£10,299 6 8	9,215 9 7

Audited and found correct,
ALBERT GOODMAN, Chartered Accountant,
Auditor.
January 17th, 1889.

Passed by Council,
January 29th, 1889.
THOS. F. PLOWMAN,
Secretary.

* There are also outstanding accounts, due from the Society for School expenses, amounting to £91 18s. 5d.

The Bath and West of England Society

Dr. CASH ACCOUNT FOR THE YEAR ENDING DEC. 31st,

RECEIPTS.	£ *s. d.*	1888. Newport. £ *s. d.*	1887. Dorchester. £ *s. d.*
BALANCE BROUGHT FORWARD, Jan. 1, 1888	..	129 5 1	1083 4 7
DIVIDENDS AND BONUS	..	646 1 2	491 0 1
SUBSCRIPTIONS FROM MEMBERS:—			
Arrears	20 12 0		39 16 0
Governors	257 16 0		288 10 0
Subscribers of £1 and upwards	655 2 0		667 9 0
Ditto of 10s.	20 11 0		24 1 0
		954 1 0	1019 16 0
LIFE COMPOSITIONS	..	100 0 0	90 0 0
SUBSCRIPTIONS PAID IN ADVANCE . . .	..		10 11 0
SALE OF JOURNAL	..	12 18 11	4 13 10
IMPLEMENTS (YARD):—			
Entry Fees	80 0 0		67 0 0
Fees for Space:—			
,, S. S.	219 15 0		141 4 0
,, O. S.	378 18 0		385 11 0
,, M. S.	480 0 0		258 15 0
,, H. S.	207 15 0		179 4 8
,, Seed	51 10 0		64 0 0
,, U. O.	131 12 6		110 2 2
Catalogue Fees	139 4 9		111 17 0
		1688 15 3	1317 13 10
Carried forward	..	£3531 1 5	

and Southern Counties Association.

1888, WITH COMPARATIVE STATEMENT FOR 1887. Cr.

PAYMENTS.	s. d.	1888. Newport. £ s. d.	1887. Dorchester. £ s. d.
GENERAL:—			
Salaries:—			
Secretary (including Clerks, Coal, Gas, &c.)	700 0 0		600 0 0
Auditor	20 0 0		20 0 0
Consulting Chemist	30 0 0		30 0 0
Consulting Botanist	25 0 0		25 0 0
		775 0 0	675 0 0
Printing	37 9 0		29 12 4
Stationery and Finance Books	34 18 11		26 14 11
Postage, Telegrams, Cheque and Receipt Stamps	63 15 3		68 1 2
Rent of Offices	26 0 0		26 0 0
Railway Fares	16 3 7		28 18 4
Carriage of Office Boxes and Parcels	5 13 2		12 1 3
Directories and Reference Books	2 15 2		1 18 9
Finance Committee's Expenses	7 7 10		3 19 6
Subscription to Bath Literary Institution	2 2 0		2 2 0
Repairs	5 7 2		4 9 1
Society of Arts for Rooms	3 13 6		3 3 0
Transfer of Stock	14 19 7		..
Subscriptions returned	1 0 0		3 9 0
Presentation to Mrs. Gray	..		12 12 0
		221 5 2	223 1 4
JOURNAL:—			
Editor's Salary	200 0 0		200 0 0
Printing	229 16 0		244 5 4
Plans	3 2 6		3 2 6
Postage, Stationery, and Journal Distribution	28 17 1		36 2 11
Payments to Authors	53 13 0		44 2 0
		515 8 7	527 12 9
IMPLEMENTS (YARD):—			
Shedding	461 10 10		448 15 9
Stewards and Assistants	38 5 10		34 7 2
Printing and Stationery	25 7 8		33 18 1
Plant Foreman's Salary	..		56 0 0
		525 4 4	573 1 0
Carried forward	..	£2036 18 1	

DR. CASH ACCOUNT—*continued.*

RECEIPTS.	£ s. d.	£ s. d.	1888. NEWPORT. £ s. d.	1887. DORCHESTER. £ s. d.
Brought forward		..	3531 1 5	..
IMPLEMENTS (FIELD):—				
Horse Hire		..		14 10 0
HORSES, CATTLE, SHEEP, AND PIGS:—				
Horses:—				
Entry Fees.	177 15 0			122 0 0
Fines and Forfeits	12 10 0			2 0 0
Grand Stand Admissions . . .	43 17 0			50 9 0
Prizes given by Newport Local Committee	55 0 0			30 0 0
		289 2 0		204 9 0
Cattle, Sheep and Pigs:—				
Entry Fees	296 6 0			325 10 0
Fines	10 9 6			32 5 0
Prizes given by Newport Local Committee	45 0 0			70 0 0
		351 15 6		427 15 0
Hurdles sold	61 7 1			50 2 0
Catalogue Sale Privilege . . .	80 0 0			80 0 0
Catalogues Sold after Show . .	0 8 10			0 6 7
Fodder Sold	1 4 0			1 14 0
		142 19 11		132 2 7
			783 17 5	764 6 7
POULTRY:—				
Entry Fees		103 9 0		126 5 0
Commission on Poultry Sales		0 3 2		2 9 3
			103 12 2	128 14 3
Carried forward		..	£4418 11 0	

CASH ACCOUNT—*continued*. Cr.

PAYMENTS.	£ s. d.	£ s. d.	1888. NEWPORT. £ s. d.	1887. DORCHESTER. £ s. d.
Brought forward		..	2036 18 1	
IMPLEMENTS (FIELD):—				
Stewards and Attendants		..		12 17 6
Printing and Stationery		..		2 12 6
Land and Crops		..		95 19 0
Shedding and Fittings		..		3 3 4
Horse Hire		..		10 17 6
				125 0 10
HORSES, CATTLE, SHEEP, AND PIGS:—				
Horses—Prizes	437 0 0			400 0 0
Shedding and Grand Stand	250 17 2			251 11 1
Stewards and Assistants	42 2 1			30 10 0
Judges	32 0 1			34 6 2
		761 19 4		716 7 3
Cattle—Prizes . . £1098 0s. 0d.; Less deferred £30 0s. 0d.	1068 0 0			918 0 0
Sheep—Prizes	395 0 0			442 0 0
Pigs—Prizes . . £181 0s. 0d.; Less deferred £6 0s. 0d.	175 0 0			197 0 6
Shedding	218 4 9			278 16 8
Stewards and Assistants	52 12 10			50 0 0
Judges	167 15 4			171 18 8
		2076 12 11		2069 15 4
Hurdles	83 15 0			81 1 4
Fodder	264 4 0			176 9 9
Steward of Fodder and Assistants	24 7 0			26 7 7
Canvas	2 13 8			1 13 7
Veterinary Inspector	19 1 0			20 11 0
Rosettes	8 6 9			7 3 9
Refreshments to Judges	13 8 7			13 1 2
Printing and Stationery	53 18 3			49 15 0
Deferred Prize of 1887	15 0 0			25 0 0
Plant				17 5 0
		484 14 3		418 8 2
			3323 6 6	3195 10 9
POULTRY:—				
Marquee, Staging, and Shed		59 17 8		66 0 8
Stewards and Assistants		23 6 3		48 0 0
Judges		15 3 0		16 12 6
Prizes		163 15 0		170 8 0
Food and Pens		14 7 6		13 1 8
Printing and Stationery		7 18 7		10 10 2
Cartage		2 12 7		7 17 6
Hampers, &c.		..		1 5 9
			287 0 7	333 16 3
Carried forward		..	£5647 5 2	

DR. CASH ACCOUNT—*continued.*

RECEIPTS.	£ s. d.	1888. Newport. £ s. d.	1887. Dorchester. £ s. d.
Brought forward	..	4418 11 0	
ARTS:—			
Commission on Pictures Sales	3 0 5		9 7 2
Catalogue Sale Privilege	5 0 0		5 0 0
Sale of Cases	..		0 2 0
		8 0 5	14 9 2
ART UNION:—			
Sale of Tickets	109 0 0		79 0 0
Difference in value of Prizes paid by Winners	5 8 0		3 10 0
		114 8 0	82 10 0
ART-MANUFACTURES:—			
Fees for Space	120 6 0		51 0 0
Fine	1 0 0		..
		121 6 0	51 0 0
WORKMEN'S EXHIBITION:—			
Donation	..	25 0 0	
MUSIC:—			
Admissions to Enclosure	..	11 7 0	6 10 8
Carried forward	..	£4698 12 5	

CASH ACCOUNT—*continued.* Cr.

PAYMENTS.	£ s. d.	1888. Newport. £ s. d.	1887. Dorchester. £ s. d.
Brought forward	..	5647 5 2	
HORSE SHOEING:—			
Prizes	8 8 0		8 8 0
Judge	5 13 6		6 0 0
Printing	0 16 8		0 8 1
Anvils, Forges, and Coals	3 19 2		5 10 9
Hire of Horses	4 12 6		..
		23 9 10	20 6 10
ARTS:—			
Labour and Fittings	44 15 9		44 4 8
Stewards and Assistants	41 13 4		46 15 6
Selector	20 0 0		20 0 0
Receiving Steward	40 0 0		40 0 0
Do. for 1886	..		10 0 0
Do. for Labour and Materials	32 1 0		41 10 5
Local Agents and Carriage	84 19 3		76 3 8
Printing and Stationery	11 5 9		10 1 7
		274 15 1	288 15 10
ART UNION:—			
Pictures purchased	191 5 2		161 4 7
Printing and Stationery	7 3 0		6 1 4
Advertising	4 4 0		4 14 0
Commission on Sale of Tickets	10 18 0		7 18 0
		213 10 2	179 17 11
ART-MANUFACTURES:—			
Labour and Fittings	41 14 2		35 13 6
Steward and Assistants	5 6 6		4 19 0
Printing	4 9 6		2 8 5
		51 10 2	43 0 11
WORKMEN'S EXHIBITION:—			
Printing and Stationery	0 7 8		
Shedding	35 11 8		
		35 19 4	
MUSIC:—			
Bands and their Fares	255 13 0		198 10 8
Erecting Band Stand and Seats	32 12 3		42 8 2
Stewards and Assistants	10 3 4		12 5 6
		298 8 7	253 4 4
HORTICULTURE:—			
Gratuities to Gardeners	118 10 0		119 0 0
Erecting and repairing of Tent and Staging	52 0 11		52 15 7
Steward and Assistants	25 16 10		32 13 11
Do. for Postage, Stationery, Printing, &c.	10 11 11		11 8 0
		206 19 8	215 17 6
Carried forward	..	£6751 18 0	

DR. CASH ACCOUNT—*continued.*

RECEIPTS.	£ s. d.	1888. NEWPORT. £ s. d.
Brought forward . . .	..	4698 12 5
CHEESE AND BUTTER:—		
Entry Fees	51 5 0	
Cheese and Butter Sales	10 1 11	
Local Prizes	..	
		61 6 11
WORKING DAIRY:—		
Admissions	71 2 0	
Butter-making Competitors' Fees	39 15 0	
Sale Privilege	2 10 0	
Local Prizes	..	
Carriage refunded	..	
		113 7 0
PLANT:—		
Plant Sold	..	..
SHOW REFRESHMENT CONTRACTS:—		
Privilege of Sale of Refreshments in Yard . .	..	370 0 0
Carried forward. . .	..	£5243 6 4

CASH ACCOUNT—*continued.* Cr.

PAYMENTS.	£ s. d.	1888. Newport. £ s. d.	1887. Dorchester. £ s. d.
Brought forward . . .	..	6751 18 0	—
CHEESE AND BUTTER:—			
Judges	13 12 9		12 19 9
Prizes	118 10 0		146 4 0
Steward	2 13 0		..
Shedding	30 8 0		53 10 3
Printing and Stationery	2 13 4		4 19 8
Carriage, &c.	0 9 6		0 1 8
		168 6 7	217 15 4
WORKING DAIRY:—			
Steward and Assistants	37 9 7		26 0 3
Judges and Demonstrators	65 4 8		62 12 0
Shedding and Canvas	118 4 5		109 4 2
Printing and Stationery	4 6 4		6 1 3
Utensils and Carriage	18 6 7		16 13 8
Prizes	34 0 0		49 12 0
Coal, Ice, Cloths, &c.	8 16 10		6 3 8
Postage, Telegrams, and Rail Fares	5 6 3		4 10 0
Analyses, &c.	1 19 6		..
		293 14 2	280 17 0
EXPERIMENTS:—			
Fees to Farmers and Bailiffs, and for Superintendence	98 14 0		134 17 6
Manures	65 6 8		72 13 4
Stewards' Assistant, and Postage	17 1 6		22 2 3
Printing and Stationery	9 13 6		10 18 3
Travelling Expenses	6 15 0		8 7 2
Analyses (1887–8)	31 13 6		14 10 0
Labels	..		6 17 0
		229 4 2	270 5 6
BEES:—			
Grant to Dorset Beekeepers' Association	..	..	10 0 0
PUBLIC ANNOUNCEMENTS:—			
Advertising	233 4 6		291 12 0
Bill Posting	139 9 7		119 11 10
Printing	89 19 5		94 7 10
Rent of Placard-Frames Stores	4 0 0		4 0 0
Repairs to Placard Frames and Carriage	7 3 7		6 11 4
		473 17 1	516 3 0
SHOW REFRESHMENT CONTRACTS:—			
Tent and Shedding	49 11 2		47 1 9
Printing	4 17 7		4 19 6
Agreement Stamps	0 4 0		0 7 6
		54 12 9	52 8 9
Carried forward . . .		£7971 12 9	

Dr. CASH ACCOUNT—*continued.*

RECEIPTS.	£ s. d.	1888. NEWPORT. £ s. d.	1[...] DORC[...] £
Brought forward . . .	..	5,243 6 4	
SHOW RECEIPTS (UNAPPORTIONABLE):—			
Exhibitors for Stand-fittings	278 8 9		26
Do. ,, (Arrears, 1887) .	5 7 0		
Cloak Room, Parcels Office, and Photographic Contracts	31 9 6		4
Miscellaneous	1 1 0		
		316 6 3	319
ADMISSIONS TO SHOWYARD:—			
Season Tickets at 7*s.* 6*d.*	149 12 6		9
Admissions at 2*s.* 6*d.*	1,684 0 0		96
Ditto at 1*s.*	1,751 15 0		1,35
Children at 1*s.*	48 6 0		4
Ditto at 6*d.*	88 5 0		6
Schools and Wheel Chairs	4 0 0		
		3,725 18 6	2,52
SUBSCRIPTIONS FROM TOWNS:—			
Exeter, for 1889 Show	..	800 0 0	80
*DAIRY SCHOOLS:—			
Entry Fees	56 5 0		
Admissions	27 3 0		
Donations	2 10 0		
Government Grant	100 0 0		
Butter Sold	27 17 7		
		213 15 7	
	£	10,299 6 8	9,21

* There are also outstanding accounts, due to the Society for School fees, &c., amounting to £16 9[...]

CASH ACCOUNT—*continued.* CR.

PAYMENTS.	£ s. d.	1888. NEWPORT. £ s. d.	1887. DORCHESTER. £ s. d.
Brought forward . . .	..	7,971 12 9	
SHOW EXPENSES (UNAPPORTIONABLE):—			
Erection of Offices and other Buildings. . .	302 17 6		380 19 4
Carriage and Storage of Plant	84 5 7		103 7 0
Stewards of Plant and Works	7 16 0		16 19 6
Exhibitors' Stand Fittings	243 13 9		232 5 11
Extension of Telegraph Wires	5 4 8		9 13 5
Insurance of Plant	4 10 0		4 10 0
Hire of Furniture	6 0 0		4 12 6
Hire of Mess Room	5 5 0		5 5 0
Gatekeepers and Yardmen	65 17 10		69 1 6
Stewards of Finance and Treasurer . . .	33 0 0		26 13 6
Finance Office and Treasurer's Clerks . . .	37 3 6		41 19 11
Cloak Room and Parcels Office	6 0 0		6 0 1
Police	148 7 10		74 8 4
Badges	8 5 1		7 15 10
Admissions returned	1 5 0		..
Catalogues for Press and Officials . . .	8 19 6		8 0 6
Purchase of Plant	25 0 7		..
Printing and Stationery	30 16 5		29 8 8
Commission on Sale of Season Tickets. . .	9 0 0		3 17 1
Yard Work and making Road	68 11 9		42 3 8
Repairing Turnstiles	11 5 0		..
Flag Poles, Baize, &c.	..		14 16 11
Tools.	..		2 10 0
		1,113 5 0	1,084 8 8
*DAIRY SCHOOLS:—			
Teachers' Salaries, Lodgings, and Fares . .	42 18 8		
Milk and Cream.	32 6 4		
Prizes	5 5 0		
Stewards' Expenses for Travelling, Hotel, and Horse Hire	44 2 6		
Purchase of Plant	4 8 6		
Carriage of Implements	5 2 10		
Attendants and Ticket Takers	6 5 5		
Printing and Advertising	26 7 6		
Secretary's Railway Fares	6 18 5		
Postage and Telegrams	8 1 9		
Judges' and Lecturers' Rail Expenses. . .	2 10 0		
Do. Do. Refreshments . . .	2 18 6		
Hire of Buildings	1 17 3		
Salt and Ice	4 9 3		
		193 11 11	
		9,278 9 8	9,086 4 6
Balance in Bank	..	1,020 17 0	129 5 1
	£	10,299 6 8	9,215 9 7

I hereby certify that I have examined the foregoing accounts for the year 1888, compared the payments with the vouchers, and found them all correct and in order.

ALBERT GOODMAN, Chartered Accountant,
Auditor.

an. 17th, 1889.

Passed by Council,
Jan. 29th, 1889.

THOS. F. PLOWMAN,
Secretary.

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* There are also outstanding accounts, due from the Society for School expenses, amounting to £91 18*s.* 5*d.*

The Bath and West of England Society

ASSETS AND LIABILITIES TO DECEMBER 31ST.

ASSETS.	1888. Newport. £ s. d.	1887. Dorchester. £ s. d.
Balance in Bank	1,020 17 0	129 5 1
INVESTMENTS (Consols, £8088 5s. 8d.; India Stock, £8000.)	16,000 0 0	16,000 0 0
VALUE OF WORKS' PLANT	739 15 4	796 18 9
VALUE OF DAIRY SCHOOLS' PLANT	26 6 10	..
SUBSCRIPTION ARREARS	117 13 0	83 17 0
Due from Exhibitors for Yard Fittings	22 9 2	5 5 7
Due on Dairy Schools Account	16 9 8	..
	17,943 11 0	17,015 6 5
Balance brought down £	16,565 12 7	15,716 15 5

and Southern Counties Association.

1888, WITH COMPARISON FOR 1887.

LIABILITIES.	1888. Newport. £ s. d.	1887. Dorchester. £ s. d.
OUTSTANDING PRIZES	36 0 0	38 0 0
EXETER MEETING	800 0 0	800 0 0
'JOURNAL,' cost of, estimated at	450 0 0	450 0 0
SUBSCRIPTIONS PAID IN ADVANCE	..	10 11 0
OUTSTANDING DAIRY SCHOOLS ACCOUNTS	91 18 5	..
	1,377 18 5	1,298 11 0
Balance carried down	16,565 12 7	15,716 15 5
	£ 17,943 11 0	17,015 6 5

Audited and found correct,
ALBERT GOODMAN, Chartered Accountant,
Auditor.
January 17th, 1889.

Passed by Council,
January 29th, 1889.
THOS. F. PLOWMAN,
Secretary.

Bath and West of England Society

(ESTABLISHED 1777,)

AND

Southern Counties Association,

FOR THE

Encouragement of Agriculture, Arts, Manufactures, and Commerce.

List of Members.

CORRECTED TO FEBRUARY 28TH, 1889, INCLUSIVE.

PATRON.

HIS ROYAL HIGHNESS THE PRINCE OF WALES, K.G.

PRESIDENT
FOR 1888-89.

THE RIGHT HON. THE LORD CLINTON.

Names thus (*) distinguished are Governors.
Names thus (†) distinguished are Life Members.

*** *Members are particularly requested to make the Secretary acquainted with any errors in the names or residences.*

Name.	Residence.	Sub-scriptions. £.	s.	d.
†WALES, HIS ROYAL HIGHNESS THE PRINCE OF	.. ..	..		
*Abergavenny, Marquess of, K.G.	Eridge Castle, Tunbridge Wells .	2	0	0
†Ackers, B. St. John . . .	Huntley Manor, Huntley, near Gloucester	..		
*Acland, Right Hon. Sir T. Dyke, Bart.	Killerton, Exeter	5	0	0
Acland, Charles T. D., M.P. .	Killerton, Exeter	1	0	0
†Acland, A. H. Dyke, M.P. .	Clynnog, Carnarvon	..		
Adams, George	Pidnel Farm, Faringdon, Berks .	1	0	0
Adams, A.	Horner Farm, West Luccombe, Minehead	0	10	0
Adams, S. W., jun. . . .	7, Boringdon Villas, Plympton St. Mary	1	1	0
Affleck, W.	Prospect House, Swindon . . .	1	0	0
†Agate, Alfred	Broomhall, Horsham	..		
Aiken, J. C.	The Glen, Stoke Bishop, Gloucestershire	1	0	0

(12).

Name.	Residence.	Subscriptions. £.	s.	d.
Albion Iron Works Co.	Rugeley, Staffordshire	1	0	0
Alexander, D. T.	Cardiff	1	0	0
†Allen, James D.	Belle Vue House, Evercreech, near Bath		. .	
Allen, Joseph	Chesterblade, Shepton Mallett	1	0	0
Allender, G. M.	31, St. Petersburgh Place, Bayswater, Middlesex	1	0	0
Ames, E. L.	Clevelands, Lyme Regis, Dorset	1	0	0
*†Amherst, Earl	Montreal, Sevenoaks		. .	
Andrews, G., jun.	Plympton	1	1	0
Anger, J.	Prospect House, Upton, Didcot	1	0	0
†Arkwright, J. H.	Hampton Court, Leominster		. .	
Arnold, W., Lieut.-Col.	Nethercott, Winkleigh, N. Devon	0	10	6
*Ashburton, Lord	The Grange, Alresford, Hants	5	0	0
Ashby, William	East Dean, Eastbourne	1	0	0
Ashcroft, W.	Hayes, Beckenham	1	0	0
Ashe, J. W. L.	Ivy Bank, Camden Hill, Chislehurst	1	0	0
Ashford, J.	Loxbeare, Tiverton	1	0	0
Asprey, F.	Somerset Villa, Bath	1	0	0
†Aveling, Thomas L.	Rochester		. .	
Avon Manure Co.	St. Philip's Marsh, Bristol	1	0	0
Aylesbury Dairy Co.	31, St. Petersburgh Place, Bayswater, London, W.	1	0	0
Ayre Bros.	The Avenue, High Street, Hull	1	0	0
Badcock, H.	Wheatleigh, Taunton	1	0	0
Badcock, H. Jeffries.	Taunton	1	0	0
Bagnall, G.	Westwell, Burford, Oxon	1	0	0
Bailey, Henry J.	Rowden, Bromyard, Hereford	1	1	0
Bailey, S.	Hornshay Farm, Wellington	1	1	0
†Baillie, Evan	Filleigh, Chudleigh		. .	
Bailwood, F. H. M.	Horsington, Wincanton	1	1	0
†Baker, L. J.	Chertsey Park, Surrey		. .	
†Baker, Robert N. G.	Heavitree, Exeter		. .	
Baker, Thomas	Compton, Newbury, Berks	1	0	0
Baker, T. H.	Mere Down, Mere	0	10	0
Baker, William	Temple Street, Bristol	1	0	0
Balche, W.	Westlecott Farm, Swindon	1	0	0
Bale, Samuel	Westacott Nursery, Barnstaple	1	0	0
Bamber, H. K., F.C.S.	Altons, Rusper, Sussex	1	0	0
Bamlett, A. C.	Thirsk, Yorkshire	1	0	0
Banbury, Alfred	Launcells, Stratton	0	10	0
Bankes, A.	Wolveton, Dorchester	1	0	0
Barchard, F.	Horsted Place, near Uckfield	1	0	0
Barge, J.	Bray Knole, South Molton	0	10	0
Barham, G. T.	College Farm, Finchley	1	0	0
Barnard and Lake	Braintree, Essex	1	0	0
*Barnett, Henry	Glympton Park, Woodstock	2	0	0
Barrett, Major William	Moredon, North Curry, Taunton	1	0	0

Name.	Residence.	£.	s.	d.
Barton, C. C.	Upton House, Rownhams, Southampton	1	0	0
Barton, John	Hackwood Farm, Basingstoke. .	1	1	0
Barttelot, Major Walter . .	Coates, Pulborough, Sussex . .	1	1	0
Basset, G. L.	Tehidy Park, Redruth	1	1	0
†Bassett, C. H.	Pilton House, Barnstaple . . .	.	.	
*Bastard, Baldwin J. P. . .	Kitley, Yealmpton, Ivybridge .	2	0	0
Bater, T.	Manor House, Chittlehamholt, near Chulmleigh, N. Devon .	1	0	0
Bath and Wells, The Right Rev. The Bishop of. . .	The Palace, Wells	1	1	0
*†Bath, Marquess of . . .	Longleat, Warminster	.	.	
Bath, Thomas S.	Glastonbury	1	0	0
Bath Gas Co.	Bath	1	0	0
Batt, A.	Westown, Bristol	1	0	0
Batt, T., jun.	Clapton, Bath	1	0	0
Battams, G. B.	Kilworthy, Tavistock	1	0	0
Batten, E. C., F.R.S.E. . .	Thornfalcon, Taunton	1	0	0
Batten, John	Aldon, Yeovil	1	0	0
†Battishill, W. J.	St. Loyes, Exeter	.	.	
Baunton, Edward	Broadway, Dorchester	1	0	0
Bayne, W.	Brock Hill, Broadclyst, Exeter .	1	0	0
†Beale, William	Larking's Farm, Chiddingstone, Edenbridge, Kent	.	.	
Beauchamp, E. B.	Trevince, Scorrier, Truro . . .	1	0	0
Beauchamp, W.	Stratton House, Stratton-on-the-Fosse, Bath	1	0	0
Beauchamp, W. B.	Norton Hall, Midsomer Norton, Bath	1	0	0
Beckingham, W. J. . . .	Upper Ashe Farm, Micheldever, Overton, Hants	1	0	0
Belfield, J. F.	Primley Hill, Paignton, Torquay	1	0	0
*†Benett-Stanford, V. F. . .	Pyt House, Salisbury	.	.	
Benjafield, Nathaniel . . .	Short's Green Farm, Motcombe, Shaftesbury	1	0	0
Bennett Brothers	*Journal* Office, Salisbury . . .	1	1	0
Benson, R. A.	11, Caledonia Place, Clifton . .	1	0	0
Bentall, Edward Hammond, & Co.	Heybridge, Maldon, Essex . .	1	0	0
*Benyon, R.	Englefield House, Reading. . .	5	0	0
Bere, R.	Milverton, Somerset	1	0	0
Berners, C. H.	Long Cross, Chertsey	1	0	0
Berriman, J.	Moredon Farm, Swindon . . .	1	0	0
*†Bertie, Lord	Uffington House, Stamford . .	.	.	
*†Best, Capt. John C. (R.N.).	Plas-yn-Vivod, Llangollen . .	.	.	
†Best, Col. George	Charlton House, Ludwell, Salisbury	.	.	
Best, Major M. G.	Park House, Boxley, Maidstone .	1	0	0
Bewsey, J. L.	Cheriton House, Temple Combe, Bath	1	0	0
Bice, J..	Newlyn East, Grampound Road, Cornwall	1	0	0

Name.	Residence.	Subscriptions. £.	s.	d.
Bickle, R.	Bradstone Hall, Tavistock	1	0	0
Bigg, Thomas	Leicester House, Great Dover Street, London, E.C.	0	10	0
Bindon, J. H.	Manager, Bath and Somerset Dairy Company, Bath	1	0	0
Birmingham, C.	Holnicote, near Minehead	0	10	0
Biscoe, W. E.	Holton Park, Wheatley, Oxford	1	0	0
Blachford, Lord	Blachford, Ivybridge	1	0	0
Blackie, A.	Tidebrook Manor, Wadhurst, Sussex	1	0	0
Blake, Abel	Loxbeare, Tiverton	0	10	0
Blake, William	Bridge House, Ilminster, near South Petherton	1	0	0
Blaker, George	Piecomb, Hurstpierpoint	1	0	0
Blommart, John	Willett House, Taunton	1	0	0
Blunt, E. T.	Blaby Hill, near Leicester	1	0	0
Blyth, J.	Pantheon, Oxford Street, London	1	0	0
Boby, Robert	Bury St. Edmunds, Suffolk	1	0	0
Body, S. J.	High Littleton, near Bristol	1	0	0
Bolitho, E.	Treridden, Penzance	1	0	0
Bond, A.	Burn Bickleigh, Tiverton	1	0	0
†Bond, N.	Creech Grange, Wareham, Dorset	..		
Boscawen, the Hon. and Rev. J. T., F.L.S.	Lamorran, Probus, Cornwall	1	0	0
Boteler, Capt. W. J. Casberd	The Elms, Taplow	1	0	0
†Boughton-Knight, A. R.	Downton Castle, Ludlow	..		
Bound, William	Hurstborne, Tarrant, Andover	1	1	0
Bouverie, P. P., jun.	Brymore, Bridgwater	1	0	0
Bouverie, W. P.	Little Cheverill, Devizes	1	0	0
†Bowerman, Alfred	Capston, Williton	..		
Boys, T. H.	Bridgwater	1	0	0
Braby, James	Maybank, Rudgwick, Horsham	1	0	0
Bracher, J. H.	Place House, Tisbury, Salisbury	1	0	0
Bradford, J. E. G.	Swindon	1	0	0
Bradford, Thos., and Co.	63, Fleet Street, London	1	0	0
†Braikenridge, John Herman.	The Rookery, Chew Magna, Bristol	..		
Braikenridge, W. J.	Newton House, Clevedon, Somerset	1	1	0
†Brassey, A.	Heythrop, Chipping Norton, Oxon	..		
*Brassey, H. A.	Preston Hall, Aylesford	2	2	0
*Brassey, Lord	Normanhurst, Battle, Sussex	5	0	0
Brendon, M. G.	Bude Haven	1	0	0
Bridges, Rev. Canon A. H.	Beddington House, Croydon	1	1	0
Bridges, John Henry	Ewell, Surrey	1	1	0
Brimble, J., and Co.	Bristol	1	1	0
Bristol Wagon Works Company (Limited)	Lawrence Hill, Bristol	1	1	0
Broad, Thomas Dyke	Bath	1	0	0
Broadmead, T. Palfrey	Enmore Park, Bridgwater	1	0	0
Brock, J. C.	High Ridge Farm, Dundry, Bristol	1	0	0
Brock, S.	Newhall, Broad Clyst, Exeter	1	0	0
Brockman, F. D.	Beach Borough, Hythe, Kent.	1	0	0
Broderip, E.	Cossington, Somerset	1	0	0

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Name.	Residence.	Subscriptions. £.	s.	d.
Brodie, Sir B. V. S., Bart.	Brookham Warren, Betchworth	1	0	0
*Brooke, Lord, M P.	Easton Lodge, Dunmow	2	2	0
Brown and Co.	Salisbury	1	0	0
Brown and May	Wilts Foundry, Devizes	1	0	0
Brown, James	Shepton Mallett	1	0	0
Brown, William Jeffery	Middlehill House, Box, Wilts	1	0	0
Browne and Co.	Bridgwater	1	0	0
Browne, Solomon	Barton, Landrake, Devonport	0	10	0
Browne, W. J.	Buckland Filleigh, Highampton	1	0	0
*Bruce, W. A.	96, Sydney Place, Bath	2	0	0
Brune, C. G. Prideaux	Prideaux Castle, Padstow	1	0	0
†Bryce, J. P.	Bystock, near Exmouth	. .		
†Brymer, William E.	Ilsington House, Dorchester	. .		
Buck, A.	Worcester	1	0	0
Buckingham, W.	Southernhay, Exeter	1	0	0
Budgett, W. E.	Stoke Bishop, near Bristol	1	1	0
Bull, Alfred	25, High Street, Guildford	1	1	0
Bull, Uriah	Mells, Frome	0	10	0
†Bullock, George Troyte	North Coker House, Yeovil	. .		
Bult, James Slee	Dodhill House, Kingston, Taunton	1	0	0
Bulteel, John	Pamflete, Ivybridge	1	0	0
Burbidge, Charles	Chitterne St. Mary, Codford, Wilts	1	0	0
Burbidge, Edwin	South Wraxall, Bradford-on-Avon	1	0	0
Burge, William	Stoke Farm, Charles, South Molton	0	10	0
Burnard, C. F.	Sutton Road, Plymouth	1	0	0
†Burrell, Sir C. R., Bart.	Knepp Castle, Sussex	. .		
Burrow, G.	Manor Farm, South Marston, Swindon	1	1	0
†Bush, J. D.	Bath	. .		
Bush, R. H.	The Castle, Chew Magna	1	0	0
Bute, Marquess of	Cardiff Castle	. .		
*Butler, Samuel	Combe Hay Park, Bath	2	2	0
Butterworth, R. W.	Rockwell, Henbury, Bristol	1	0	0
Calmady, V. P.	Tetcot, near Holsworthy, Devon	1	0	0
*Calthorpe, Lord	Elvetham Park, Winchfield	2	0	0
Calvert, Col. A. M.	Ockley Court, Dorking	1	0	0
Campbell, C. Lee	Glewstone Court, Ross	1	0	0
Campion, W. H.	Danney, Hassocks, Sussex	1	0	0
Cannon, H.	Milton, Clevedon, Evercreech	1	0	0
Capel, Arthur	Bulland Lodge, Wiveliscombe	1	1	0
Caple, J.	Beach Farm, Bitton, Gloucestershire	1	0	0
*Carew-Gibson, G. C.	Sandgate, Pulborough, Sussex	2	0	0
Carey, William	Shepton Mallett	1	0	0
*Carlingford, Lord	The Priory, Chewton Mendip, near Bath	2	2	0
†Carnarvon, Earl of	High Clere Castle, Newbury	. .		
Carson and Sons	La Belle Sauvage Yard, Ludgate Hill, London	1	1	0

Name.	Residence.	Subscriptions. £.	s.	d.
Carson and Toone	Warminster	1	0	0
†Carter, E.	Puckpool House, Ryde, Isle of Wight	..		
Carter, J., and Co.	238, High Holborn, London	1	1	0
†Carter-Wood, Joseph	Artillery Place, Victoria Street, Westminster	..		
†Cartwright, F. F.	7, Percival Road, Clifton	..		
Carver, John	West House, Chilton Polden, Bridgwater	1	0	0
Cary, Edmund	Pylle, Shepton-Mallet	0	10	0
Cary, John	Steeple Ashton, Trowbridge	0	10	0
Castle, R.	18, Merton Street, Oxford	1	0	0
Castle, T., jun.	Banwell House, Banwell	1	0	0
Cater, R. B.	Bath	1	1	0
†Catt, C. W.	52, Middle Street, Brighton (Hon. Local Sec., 1885)	..		
*Cawdor, Earl of	Stackpole Court, Pembroke	2	0	0
Ceysey, F.	Bratton, Chittlehampton, Devon	1	0	0
Chamberlain, Pole, and Co.	Bristol	1	0	0
Chamier, E. F.	Stratton, Cornwall	1	0	0
Chamings, R.	High Bray, South Molton	0	10	0
Champion, E.	Church Farm, Congresbury	1	0	0
Champion, S. H.	Newbery Farm, Kilmersdon, Bath	1	0	0
Channon, J.	Wishford, Broad Clyst, Exeter	1	0	0
Chaplin, L. A.	South Marston, Swindon	1	0	0
†Chapman, C.	Carlecotes Hall, Dunford Bridge, near Sheffield	..		
Chapman, G.	Radley, near Hungerford, Berks	1	1	0
Chapman, W. W.	Estate Office, Wadhurst Park, Hawkhurst, Sussex	1	0	0
Chesham, Lord	Latimer, Chesham, Bucks	1	0	0
Chichester, C.	Kenn, near Exeter	1	0	0
Chick, John	Compton Valence, Dorchester	1	0	0
Chorley, W. L.	Quarme, Dunster, Somerset	1	1	0
Christie, A. L.	Tapeley Park, Bideford	1	0	0
Churchouse, A.	Westholme, Shepton Mallet	1	0	0
Clark, Isaac	The Manor, Heddington, Calne	1	0	0
Clark, James	Street, Glastonbury	1	0	0
†Clark, J. J.	Goldstone Farm, West Brighton (Hon. Local Sec., 1885)	..		
Clark, W. S.	Street, Glastonbury	1	0	0
Clarke, Isaac	West Lynch, Selworthy	1	0	0
Clarke, John	West Luccombe, Minehead	1	0	0
Clarke, Joshua	Minehead	1	0	0
†Clarke, T. E.	Parks, Minehead	..		
Clayden, H.	Northoe, Park View, Hoddesdon	1	1	0
*Clayton, Shuttleworth, and Co.	Lincoln	2	2	0
Cleave, W. C.	Sanctuary, Crediton, Devon	1	1	0
Clerk, Edmund H.	Burford, Shepton-Mallet	1	0	0
*Cleveland, Duke of	Bathwick, Bath	2	0	0
†Clifford, Lord	Ugbrook, Chudleigh	..		
Clifton, J. H.	Upland House, Keynsham, Bristol	1	1	0

Name.	Residence.	£.	s.	d.
Clinton, Lord	Heanton Satchville, Beaford, North Devon	1	0	0
Clothier, Frederick	Coxpitt Farm, Bridgwater	0	10	0
Clutton, Henry	Hartswood, Reigate	1	0	0
Clutton, John	3, Sussex Sq., Hyde Park, London	1	0	0
Clutton, Robert Geo.	35, New Bond St. London	0	10	0
Clutton, R. W.	Doner's Lodge, Reigate	1	0	0
Coates, S. B.	Stanton Drew Court, Pensford	1	0	0
Cock, George	Dowerlands, South Molton	1	0	0
Cockey and Sons	Frome Selwood	0	10	0
Cole, William	Wellow, near Bath	1	1	0
Cole, W. D.	Bicester, Oxon	1	0	0
Coleman and Morton	London Rd. Iron Works, Chelmsford	1	0	0
Coleman, W. T.	Langley Fitzurse, Chippenham	1	0	0
Coles, R.	Middleton, Norton Bavant, Warminster	1	0	0
Coles, C. and T.	Manor House, Winterbourne Stoke, Salisbury	1	0	0
Colfox, T. A.	Coneygar, Bridport	1	0	0
Colfox, W.	Westmead, Bridport	1	0	0
Collins, C. H.	Chew Magna, Somerset	1	0	0
Collins, C. R.	Strathculm, Hele, Cullompton	1	1	0
Collins, D.	Newton Ferrars, Carrington, Cornwall	1	0	0
Collins, T. M.	Inst Hill Farm, Olveston, Gloucestershire	1	0	0
Collins-Splatt, Col. H.	Brixton House, Plympton	1	1	0
Colman, J. J., M.P.	Carrow House, Norwich	1	1	0
Colmer, Jas.	Redland Knoll, Bristol	1	1	0
Colthurst, Symons, and Co.	Bridgwater	1	0	0
*Combe, R. H.	Pierrepont, Farnham	2	0	0
*Combe, R. T.	Earnshill, Curry Rivell, Taunton	2	0	0
Coney, Herbert F.	The Poplars, Pucklechurch, Bristol	1	0	0
Cooling, G., and Son	Northgate Street, Bath	1	0	0
Coombs, G.	Radstock, near Bath	1	0	0
Coombs, Joseph	Radstock, Bath	1	0	0
Cooper, G.	Branscombe, near Sidmouth	0	10	0
Cooper, G. H.	Inglesham Dairy, Lechlade	1	0	0
Cooper, P. N.	Westbury-on-Trym, Bristol	1	0	0
†Cooper, P. W. D.	99, Pembroke Road, Clifton		..	
Corbett, J. R.	More Place, Betchworth, Surrey.	1	0	0
Corbett, J. S.	Cogan Pill, near Cardiff	1	1	0
Corbett, Thomas	Perseverance Iron-Works, Shrewsbury	1	0	0
*Cork and Orrery, The Earl of	Marston, near Frome	2	2	0
Cornish, H. J.	Pyt House, Thornford, Sherborne	1	0	0
Corp, W. F.	Woodbine Farm, West Pennard, Glastonbury	1	0	0
Cory, R.	Langdon Court, Plymouth	1	0	0
*Coryton, Col. A.	Pentillie Castle, Plymouth	2	0	0

Name.	Residence.	Subscriptions. £.	s.	d.
Cotterell, W.	Derry Ormond Park, Cardigansh.	1	0	0
Cotton, R. W.	Bultonsbury, Glastonbury	1	0	0
Courtenay, Hugh	Dunster, Taunton	1	0	0
†Coussmaker, Lieut.-Col. G.	Westwood, Guildford, Surrey	..		
*Coventry, The Earl of	Croome Court, Severn Stoke, Worcestershire	2	0	0
Coxon, C.	Elford Park, Tamworth, Stafford	1	0	0
Crane, James	Torpuddle, Dorchester	1	0	0
Crang, F.	Timsbury	1	0	0
Crawshay, W. S.	Cyfarthfa Castle, Merthyr Tydvil	1	0	0
Crees, C.	Seymour Court Farm, Beckington	1	0	0
Crick, Thomas	Great Ash, Winsford, Dulverton	0	10	0
†Cubitt, Rt. Hon. Geo., M.P.	Denbies, Dorking	..		
*Cubitt, William	Tallipit Mounts, R.S.O., S. Devon	2	0	0
Culverwell, George	Whitelackington House, Ilminster	1	0	0
Culverwell, W. T.	Durleigh Farm, Bridgwater	1	0	0
Cuming, A. P.	Moreton Hampstead, Devon	1	0	0
Custance, Mrs. M.	Brook Heath, Breamore, Salisbury	1	0	0
Dairy Supply Company	Museum St., Bloomsbury, London	1	0	0
Dalgety, Frederick G.	Lockerley Hall, Stockbridge, Hants	1	0	0
†Damer, Capt. G. Dawson	Came, Dorchester	..		
Danger, Thomas	Rowford Lodge, Taunton	1	0	0
Daniel, Rev. H. A.	Manor House, Stockland, Bridgwater	1	0	0
†Daniel, H. T.	Manor House, Stockland, Bridgwater	..		
Daniel, J. F.	Stuckeridge, Tiverton, Devon	1	0	0
Daniel, Thos. C.	Stoodleigh, Tiverton	1	1	0
Darby, A. E. W.	Little Ness, Shrewsbury	1	0	0
Darby, E.	Liscombe, Dulverton	1	0	0
*Darnley, Earl of	Cobham Hall, Gravesend	5	0	0
†Davenport, Rev. George	Foxley, Hereford	..		
†Davey, J. Sydney	Brockym House, Helston, Cornwall	..		
Davey, Sleep, and Co.	St. Germans, Cornwall	1	0	0
Davies, J. T.	Tyla Gwyn, Pontlanfraith, Newport, Mon.	1	0	0
Davis, H. J.	Doulting, near Shepton Mallett	1	0	0
†Davy, W.	Tracy Park, Bath	..		
Davy, W. H.	Chelwood House, Chelwood, near Bristol	1	0	0
*Daw, R. R. M.	Glen Croft, St. Leonards, Exeter.	2	0	0
Dawson, W. and F.	Market Place, Bath	1	0	0
Day, George Hill	Buckland Barton, Braunton, Barnstaple	0	10	0
†Day, Son, and Hewitt	22, Dorset St., Baker St., London	..		
†Deacon, W. A.	20, Birchin Lane, London, E.C.	..		
Dean, S.	Newport, Mon.	1	0	0

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Name.	Residence.	Sub-scriptions. £.	s.	d.
†De Broke, Lord Willoughby	Compton Verney, Warwick . .	. .		
De' Cetto, Col.	Brook Lodge, Holm Wood, Dorking, Surrey	1	0	0
*De Mouilpied, T.	Secretary Société Royale d'Agric., Manor Place, Guernsey . . .	2	0	0
†De Murrieta, A.	Wadhurst Park, Hawkhurst, Sussex	. .		
Dendy, R.	West of England Annato Works, Bishop's Sutton, Bristol . .	1	0	0
Dendy, Rev. Samuel . . .	Lattiford House, Wincanton . .	1	0	0
Dening, C., and Co. . . .	Chard, Somerset	1	0	0
Denison, Rev. Archdeacon .	East Brent, Somerset	1	1	0
†De Vitre, H. Denis . . .	Charlton House, Wantage . . .	. .		
*Devonshire, Duke of, K.G. .	Chatsworth, Derbyshire . . .	5	0	0
*Dickinson, F. H.	Kingweston, Somerton	2	0	0
Dickinson, W.	17, Cannon Place, Brighton . .	1	1	0
Dickson, F. and A., and Sons	Chester	1	1	0
Digby, Lord	39, Belgrave Square, London, S.W.	1	0	0
Digby, G. D. W.	Sherborne Castle, Sherborne . .	1	0	0
Dixon, C. B.	Clatford, Bevois Hill, Southampton	1	0	0
Dodington, T. Marriott . .	Horsington, Yeovil	1	1	0
Drake, T. C.	Butcombe Court, East Somerset .	1	0	0
Dredge, James	Cutsey Trull, Wellington . . .	1	0	0
Drewe, Major-General F. E. .	The Grange, Honiton, Devon . .	1	1	0
Druce, A. F. Milton . . .	Fyfield, Abingdon, Berks . . .	1	0	0
†Druce, Joseph	Eynsham, Oxford	. .		
*Ducie, Earl of	Tortworth Court, Falfield, R.S.O., Glos.	2	0	0
Duckering, C. E.	Whitehoe, Kirton Lindsey. . .	1	0	0
Duckham, T.	Baysham Court, Ross	1	0	0
Duckworth, R.	The Cloisters, Bath	1	0	0
Duke, Blake	Lyminster, Arundel, Sussex . .	1	0	0
†Dunboyne, Lord	Greendale, Clyst St. Mary, Exeter	. .		
Dunn, William	Frome	1	0	0
Dunning, H. E.	Castle Brewery, Newport, Mon.	1	0	0
†Duntze, Sir John, Bart. . .	Exleigh, Starcross, Devon . . .	. .		
†Durrant, Edward	Tunbridge Wells (Hon. Local Sec. 1881)	. .		
Dyke, Thomas	Long Ashton Lodge, Clifton, near Bristol	1	0	0
*Dyke, Rt. Hon. Sir W. Hart, Bart., M.P.	Lullingstone Castle, Eynsford. .	2	2	0
†Dymond, Edward E. . . .	Oaklands, Apsley Guise, Woburn	. .		
Dymond, Francis W. . . .	Exeter	1	0	0
Eames, T. P.	Cotley Farm, Chard.	0	10	0
East Yorkshire Cart Co. . .	Beverley, Yorks.	1	0	0
Easton, Richard	Heale Mount, Taunton	1	0	0
†Edgcumbe, E. R. Pearce . .	Somerleigh, Dorchester . . .	. .		

Name.	Residence.	Subscriptions. £.	s.	d.
Edgington, Benjamin	2, Duke Street, London Bridge	1	0	0
Edmondson, A.	Tunley Farm, Bath	1	0	0
Edwards, C. L. Fry	Wrington, R.S.O., Somerset	1	0	0
Edwards, A. P.	Hutton, Weston-super-Mare	1	0	0
†Egmont, Earl of	Cowdray Park, Midhurst, Sussex		..	
Eldridge, Pope and Co.	Dorchester	1	0	0
*Ellesmere, Earl of	Worsley Hall, Manchester	2	0	0
*Elliot, J. J.	Leigham House, Plympton	1	0	0
Ellis, E.	Summersbury Hall, Shalford, near Guildford	2	2	0
Ellis, J.	Maidstone	1	0	0
*Elton, Sir E., Bart.	Firwood, Clevedon	2	2	0
Elworthy, Charles	Stone Farm, South Molton	1	0	0
Enys, F. G.	Enys, Penryn, Cornwall	1	0	0
Ernst, Major Henry	Wescombe House, Evercreech, Bath	1	0	0
Esdaile, C. E. T.	Cothelstone House, Taunton	1	0	0
Evans, Daniel	Winsford, Dulverton	0	10	0
Evans, H. J.	Greenhill, Whitchurch, Cardiff	1	0	0
†Eyre, C.	Welford Park, Newbury		..	
*Falmouth, Viscount	Tregothnan, Probus, Cornwall	2	0	0
Farthing, Herbert	Thurloxton, Taunton	1	0	0
Farthing, Robt.	Faringdon, North Petherton, Bridgwater	1	0	0
†Farwell, F. Geo.	Laura Place, Bath		..	
Faunce de Laune, C. de L.	Sharsted Court, Sittingbourne	1	0	0
Fellows, Jas.	Kingston Park, Dorchester	1	0	0
Fellows, J. H.	Kingston Park, Dorchester	1	0	0
Fenn, T.	Ludlow Estate Offices, Downton Castle, Bromfield, Salop	1	0	0
Ferme, G.	Leigham Lodge Farm, Streatham Hill	1	0	0
Ffooks, Thos.	Totnell Corner, Sherborne, Dorset	1	0	0
*Field, Barclay	26, Hill Street, Berkeley Square, London	2	2	0
Fife, Capt. W.	Sherborne, Dorset	1	1	0
Filliter, F.	St. Martins House, Wareham	1	0	0
*†Finch, C. H. M.	Salisbury		..	
Firth, F. H.	Cator Court, Ashburton	1	0	0
Fish, George	Selworthy, Taunton	1	0	0
Fisk, J. R.	Brightstone, Isle of Wight	1	0	0
†Fletcher, Lionel J. W.	Elmscroft, West Farleigh, Maidstone		..	
Fletcher, C. E.	Elmscroft, West Farleigh, Maidstone	1	0	0
†Flower, George F. Applin	The Buildings, Stafford Farm, Dorchester		..	
Flower, James	Chilmark, Salisbury	1	0	0
Flower, Rev. W.	The Vicarage, Sandwich	1	1	0
†Fookes, Henry	Whitchurch, Blandford		..	

Name.	Residence.	Sub-scriptions. £.	s.	d.
*Ford, Henry	Lower House, Branscombe, Sidmouth	2	2	0
Ford, Jas.	Wraxall Court, Nailsea, near Bristol	1	1	0
Forster, W. S.	Gore Court, Maidstone	1	0	0
*Fortescue, Earl	Castle Hill, South Molton	2	0	0
Fowler, E. P.	Gloucester Square, Southampton	1	0	0
Fowler, Richard	Broughton, Aylesbury	1	0	0
Fowler, W. H.	Taunton	1	0	0
Fox Brothers and Co.	Wellington, Somerset	1	0	0
†Fox, Robert	Falmouth	.	.	
Foxcroft, E. T. D.	Hinton Charterhouse, Bath	1	1	0
Francis, William	Winstout, Crediton	0	10	0
Franklen, Col. C. R.	Clemenstone, Bridgend	1	0	0
*Freake, Sir T., Bart.	Warfleet House, Dartmouth	2	2	0
Freeman, H. W., M.D.	24, Circus, Bath	1	1	0
Freeth and Pocock	74, Wandsworth Road, London	1	0	0
Froom, Robert	Broad Clyst	1	0	0
Fry, John S.	7, Cathedral Green, Wells	1	0	0
Fry, W.	Stoney Stratton, Evercreech	1	0	0
†Fryer, William Rolles	Lytchett Minster, Poole	.	.	
Fuller, E. R.	The Hill, Batheaston	1	1	0
†Fuller, G. Pargiter, M.P.	Neston Park, Corsham	.	.	
Fuller, R. W.	37, High Street, Croydon	1	0	0
Fuller, S. and A.	Bath	1	0	0
Fuller, W. M.	Ely House, Wolverhampton	1	0	0
Fursdon, Charles	Fursdon, Tiverton	1	0	0
†Galloway, W. G.	Cridland Farm, Spaxton, Bridgwater	.	.	
Gammin, Joseph	West Holwell, Parncombe, N. Devon	0	10	0
Gardner, Adam	Butsper, Launcells, Holsworthy	0	10	0
Gardiner, Alfred, and Sons	Nelson Street, Bristol	1	1	0
†Gardiner, J. R.	Duchy of Cornwall Office, 55, Victoria Street, Westminster	.	.	
Garne, John	Great Rissington, S.O., Gloucester	1	0	0
*Garratt, Lt.-Col. T. A. T.	Bishop's Court, Exeter	2	2	0
Garth, T. C.	Haines Hill, Twyford	0	10	0
Gear, W. H.	Union Street, Bath	1	1	0
Geare, John	Exeter	1	1	0
*†George, William E.	Howe Croft, Stoke Bishop, Bristol	.	.	
Gerrish, J.	Chipping Sodbury	1	0	0
†Gibbins, G.				
Gibbons, George	Tunley, near Bath	1	0	0
Gibbons, Sinnock and Co.	Counterslip, Bristol	1	0	0
†Gibbs, Antony	Charlton Court, Nailsea	.	.	
†Gibbs, H. M.	Barrows Court, Flax Bourton, R.S.O., Somerset	.	.	
Gibbs, Jas., and Co.	16, Mark Lane, London	1	0	0
Gibbs, William S.	Batts Park, Taunton	1	1	0
Gifford, J.	Moorledge, Chew Magna, Bristol	1	0	0

Name.	Residence.	Subscriptions. £. s. d.
Gifford, Samuel L.	253, High Street, Exeter	0 10 6
Gilbey, W.	Cambridge House, Regent's Park, London	1 0 0
Gill, Frederick	Speenhamland, Newbury	1 1 0
Gill, Alfred	St. James Street, Brighton.	1 1 0
Gilling-Gilling, Capt. T.	Manor House, Bathford, near Bath	1 0 0
†Gladstone, J.	Bowden Park, Chippenham	..
Glass, C. H.	Winsford, Dulverton	1 0 0
Glass, F.	Ellicombe House, Dunster, Minehead	1 0 0
*Glyn, Sir Richard G., Bart.	Gaunt's House, Wimborne.	2 2 0
Glynn, W. A..	Seagrove, Sea View, Isle of Wight	1 0 0
Goddard, A. L.	The Lawn, Swindon	1 0 0
Godman, Capt. J.	Park Hatch, Godalming	1 0 0
Goldney, G. Prior	Derriads, Chippenham	1 0 0
Goldney, Sir G., Bart.	Beechfield, Corsham	1 0 0
Good, C.	High Littleton House, near Bath	1 0 0
Goodden, J. R. P.	Compton House, Sherborne	1 0 0
Goodford, A. J.	Chilten Cantels, Ilchester	1 0 0
Goodwin, J.	Priory Court, Cheltenham	1 0 0
Gore-Langton, W. F.	2, Princes Gate, London, W.	1 0 0
*Gore-Langton, W. S..	Newton Park, Newton St. Loe	2 2 0
Goring, C.	Wiston Park, Steyning	1 0 0
*Goring, Rev. John	Wiston Park, Steyning	2 2 0
†Gorringe, Hugh	Kingston-by-Sea, Brighton	..
Goschen, Right Hon. G. J., M.P.	69, Portland Place, London, W.	1 0 0
Graham, George	The Oaklands, Birmingham	1 0 0
Grant, W. J. A.	Hillesdon, Cullompton	1 0 0
*Gray, Mrs.	3, Airlie Gardens, Campden Hill, London, W.	2 2 0
†Green, H. L.	Ville Amphrey Farm, St. Martin's, Guernsey	..
†Greene, Thomas L.	Les Douvres, Guernsey.	..
Gregory, G. B., M.P.	Boarzell House, Hurst Green, Sussex	1 0 0
Grenfell, Arthur R.	4, Savile Row, London, W.	1 0 0
Griffin, B.	New House, Broad Clyst, Exeter	1 0 0
Grove, Sir T. Fraser, Bart., M.P.	Fern House, Salisbury	1 0 0
*†Guest, Merthyr	Inwood, Henstridge, Blandford	..
Gunn, G.	Victoria Mills, Bath	1 1 0
Gunning, G.	Feltham Frome, near Frome	1 0 0
Guyon, Rev. H. C.	The Rectory, Lamyat, Bath	1 0 0
†Hall, J. F.	Sharcombe, Wells	..
Halliday, J.	Chapel Cleve, Taunton	1 0 0
Ham, J., jun.	Broadclyst, Exeter	0 10 0
Ham, William	Worridge, Collumpton	0 10 0

Name.	Residence.	£.	s.	d.
†Hambro, C. J. T., M.P. . .	Milton Abbey, Blandford . . .		..	
†Hambro, Everard A. . . .	Hayes Place, Beckenham, Kent .		..	
Hamilton, Hon. Mrs. A. B. .	Combs, Stowmarket	1	0	0
Hammill, J. B.	Bridgwater	1	1	0
Hammond, A.	Royal Crescent, Bath	1	1	0
†Hampden, Viscount . . .	Glynde near Lewes		..	
Hancock, Rev. F.	Selworthy, Somerset	1	0	0
Hancock, J. D.	Halse, Taunton, Somerset . . .	1	0	0
*Hancock, W.	The Bank, Wiveliscombe . . .	2	2	0
Handley, J.	Green Head, Milnthorpe, Westmoreland	1	0	0
Harbord, Rev. H.	East Hoathley Rectory, Hawkhurst, Sussex	1	0	0
Harbottle, E.	Topsham	1	0	0
Harding, R.	Fenswood Farm, Long Ashton .	1	0	0
Harding, S.	Bower Ashton, Clifton, Bristol .	1	0	0
Harding, T. K.	Ashton Gifford House, Codford, Bath	1	0	0
Harding, Webber	Highercombe, Dulverton . . .	1	0	0
Hardinge, Viscount . . .	South Park, Penshurst	1	1	0
Hardy, C.	Grittisham, Honiton.	1	1	0
Harford, W. H.	Old Bank, Bristol	1	0	0
Harris, Nicholas	Shernick, Launcells, Holsworthy	0	10	0
Hassell, J.	Inglescombe, Bath	1	0	0
Hathaway, G.	Royal Prize Churn Works, Chippenham	1	0	0
Hawkes, T.	Williton, Taunton	1	0	0
†Hawkins, J. Heywood . .	Bignor Park, Petworth . . .		..	
Hawkins, Rev. J. B. H. . .	Rectory, Chelwood, Bristol. . .	1	0	0
Hayes, F. J.	West Pennard, Glastonbury . .	1	0	0
Haynes, J. G.	The Briars, Sanford Churchill, Bristol	1	0	0
Hayter, J..	Stourton Caundle, Blandford . .	1	0	0
Hayter, Sir A., Bart. . . .	Trevina, Tintagel, Cornwall . .	1	0	0
Heard, H..	Shepton Mallet	1	0	0
Heasman, A.	Calceto, Arundel	1	0	0
Heasman, J. E.	Ecclesden Manor, Angmering, Arundel	1	1	0
*Heathcoat-Amory, Sir J. H., Bart.	Tiverton, Devon	2	2	0
Heathcote-Amory, J. M. . .	Knightshayes, Tiverton . . .	1	0	0
Hellier, T.	Wick St. Lawrence, Weston-super-Mare	1	0	0
Helme, Captain Burchell . .	Bishopstrow House, Warminster.	1	0	0
Helyar, Major G.	3, Oakbank, Shelford, Manchester	1	0	0
Herbert, Thomas	Even Farm, Cirencester . . .	1	0	0
Hesse, F. W..	Wrington, R.S.O., Som. . . .	1	0	0
Hewett, Henry T.	Norton Court, Taunton . . .	1	1	0
Higgins, J.	Pylle, Shepton Mallet	1	0	0
Hill, B. H..	Belluton House, Pensford, Bristol	1	0	0
†Hill, Charles	Clevedon Hall, Somerset . . .		..	
†Hill, Col. E. S., C.B. . . .	Rookwood, Llandaff		..	

Name.	Residence.	Subscriptions. £.	s.	d.
Hill, E.	Evercreech, Bath	1	0	0
Hill, E.	Stratton House, Evercreech, Bath	1	0	0
Hill, J.	Felhampton, Church Stretton, Salop	1	0	0
Hill, J. H.	Paulton, Bristol	1	0	0
Hill, Sidney	Langford House, Langford, R.S.O.	1	1	0
Hillard, J.	Hook Farm, Stoke Trister, Wincanton	1	0	0
Hine-Haycock R. W.	Belmont, Sidmouth	1	0	0
Hippisley, Edwin	Wells, Somerset	1	0	0
†Hippisley, J. H.	Stone Easton, Old Down, Bath		..	
*Hoare, C. A. R.	37, Fleet Street, London	2	2	0
*Hoare, C.	37, Fleet Street, London	2	0	0
Hoare, S.	7, Hereford Gardens, London, W.	1	0	0
*Hoare, W.	Staplehurst	2	0	0
†Hockin, Edward	Poughill Vicarage, Stratton, Cornwall		..	
Hoddinott, E.	Stratton St. Margaret, Swindon	1	0	0
*†Hodgson, J. Stewart	Lythe Hill, Haslemere, Surrey		..	
Hole, George	Corton Denham, Sherborne	0	10	0
Hole, Henry	Hazlebury, Plucknett, Crewkerne	0	10	0
†Holdsworth, Henry M.	Wilton, near Salisbury		..	
*Holford, R. Steiner	Weston Birt House, Tetbury	2	2	0
Holland, J.	Keynsham, Bristol	1	0	0
Holmes, E. Carleton	Brookfield, Arundel	1	0	0
*Holmes and Sons	Prospect Place Works, Norwich	2	2	0
Holt, W. D.	Manor Farm, Castle Cary, Somerset	1	0	0
*Hood, Sir A. Acland, Bart.	St. Audries, Bridgwater	5	0	0
†Hood, The Hon. Col.	8, Grosvenor Gardens, London, S.W.		..	
†Hooper, R. N.	Stanshawes Court, Chipping Sodbury		..	
Hopkins, W.	Cricklade	1	0	0
†Horner, J. F. Fortescue	Mells Park, Frome		..	
Hornsby and Sons (Limited)	Grantham, Lincoln	1	1	0
Horton, J.	Rabson Farm, Winterbourne Bassett, Swindon	1	0	0
Horton, Rev. Le G.	Wellow Vicarage, Bath	1	1	0
Hosegood, Obed., jun.	Dillington, Ilminster	0	10	0
Hosken, W. and Son	Loggans Mill, Hayle, Cornwall	1	0	0
How, J. H.	Woodville, Bideford	1	0	0
Howard, J. and F.	Britannia Works, Bedford.	1	0	0
Howse, John	Leighland, Washford, Taunton	1	0	0
Hubbard, W. E.	Leonards Lee, Horsham	1	0	0
Huddleston, J. E.	Hill Wood, Eastham, Tenbury, Worcestershire	1	0	0
†Hughes, A. E.	Wintercott, Leominster		..	
Hughes, James	5, Bow Church Yard, London, E.C.	1	0	0
Hughes, James	Wood Lawn, Oxford	1	1	0
Hughes, J. J.	Corn Market Street, Oxford	1	0	0
Hughes-Hallett, H.	Willesborough, Ashford, Kent	1	0	0

Name.	Residence.	Subscriptions. £. s. d.
Hull, W. S.	Druce Farm, Puddletown, Dorchester	1 0 0
†Hulse, Sir Edward, Bart.	Breamore, Salisbury	. .
Humphries, E.	Pershore, Worcester	1 0 0
Hunter, J.	Seed Merchant, Chester	1 0 0
Hunter, Sir Paul, Bart.	Mortimer Hill, Reading	1 0 0
Hurford, H. R.	Brightlands, Stockbridge, Hants	1 1 0
Hurst and Son	152, Houndsditch, London	1 0 0
†Hussey, Col.	Highcliffe, Lympstone, Devon	. .
Hussey Freke, A. D.	Hannington Hall, Highworth, Wilts	1 0 0
Hussey, John Richards	Beechcroft, St. Davids, Exeter	0 10 0
Hutchings, R. R.	High Street, Wincanton	1 0 0
Huth, L.	Possingworth Manor, Waldron, Sussex	1 0 0
*Hylton, Lord	Charlton, near Radstock	2 2 0
*†Ilchester, Earl of	Melbury, Dorchester	. .
Imbert-Terry, H. M.	Woodlands, Kennford, near Exeter	1 0 0
Ingram, Lieut.-Col. R. B.	Steyning, Sussex	1 1 0
Ireland, J. C. C.	Brislington Hall, near Bristol	1 0 0
Jackson, R.	Westhorpe, Marlow, Bucks	1 0 0
Jackson, W.	Manor House, Dawlish, Devon	1 0 0
James, Alfred B.	38, Apsley Road, Clifton, Bristol	1 1 0
James, James	Les Vauxbelets, Guernsey	1 0 0
Jeffery and Blackstone	Rutland Iron Works, Stamford, Lincoln	1 1 0
Jefferis, W. H.	Hill House, Henbury, near Bristol	1 0 0
Jenkin, S. W.	Liskeard, Cornwall	0 10 0
*Jersey, Earl of	Middleton Park, Bicester, Oxon	2 0 0
†Jonas, F. N.	Crishall Grange, Saffron-Walden	. .
†Jonas, George	Ickleton, Saffron-Walden	. .
†Jones, Henry Parr	Portway House, Warminster	. .
Jones, Major F. J.	Chippenham	1 1 0
Jones, Winslow	Exeter	1 1 0
Keen, J. R.	Chewton Farm, Ston Easton, Bath	1 0 0
Keene, James B. and Co.	*Journal* Office, Bath	1 0 0
Kell, Meats and Co.	Gloucester	1 0 0
Kemble, C. A.	East Wood, E. Harptree, Blagdon, R.S.O.	1 0 0
Kemble, Henry	Overtown, Swindon, Wilts	1 0 0
Kennard, Rev. R. B.	Marnhull Rectory, Blandford.	1 0 0

Name.	Residence.	Subscriptions. £.	s.	d.
Kennaway, Sir J. H., Bart., M.P.	Escot, Ottery St. Mary	1	1	0
†Kettlewell, W. W.	East Harptree Court, Bristol	..		
Kidner, John	Nynehead, near Wellington, Som.	1	0	0
Kindersley, E. L.	Clyffe, Dorchester	1	0	0
King, Francis Thornley	15, Queen Square, Bath	1	1	0
†King, J. Goddard	Beaton, Newbury	..		
King and Son, R.	Milsom Street, Bath	1	0	0
King, Sir Wm. D.	Lynwood, Waverley Rd., Southsea	0	10	0
Kinneir, H.	Redville, Swindon	1	0	0
Kirk, G.	Dowerlands, South Molton	0	10	0
Kirkpatrick, J.	Horton Park, Hythe	1	0	0
Knapman, A.	Loxbeare, Tiverton	0	10	0
Knatchbull, W.	Trull, Tetbury	1	0	0
†Knight, Sir F. W., Bart.	Simonsbath, South Molton	..		
Knight, R.	Luccombe, Minehead	1	0	0
Knight, Rev. T. H.	Bordhays, Honiton	1	1	0
Knollys, J. E.	Fitzhead Court, Taunton	1	0	0
†Kruse, W.	Leeds, near Maidstone	..		
Lakeman, Thos.	Brixham, Devon	0	10	0
Lamoreaux, G.	6, Bovingdon Villas, Plympton	1	1	0
Lamport, Messrs. C.	Bindon House, Wellington	1	0	0
Lance, C. E.	Stoke Court, Taunton	1	0	0
Langdon, C.	Penrocks Lodge, Chard	1	0	0
Langley, B. W.	King's Lynn, Norfolk	1	1	0
Langworthy, W. F.	Clevedon, Somerset	1	0	0
Lankester and Co.	110, Southwark Street, London	1	0	0
Lansdown, H. J.	Colestock, Ottery St. Mary, Devon	1	0	0
*Lansdowne, Marquis of	Bowood, Calne	2	0	0
Laver, R.	Kingweston, Somerton	1	0	0
Laver, S.	St. Georges, Worle, Weston-super-Mare	1	0	0
Lawrence, Col.	Keyworth, Wain Vawr, near Newport, Mon.	1	0	0
Leach, R.	Half Moon Hotel, Yeovil	1	0	0
Le Brocq, Francis	St. Peter's, Jersey	1	0	0
Le Brocq, Capt. P.	Broughton Lodge, St. Marys, Jersey	1	0	0
*Leconfield, Lord	Petworth, Sussex	2	0	0
Le Cornu, A. J.	Highfield, St. Owen's, Jersey	1	0	0
Legg, E. Gapper	Coombe Down, Beaminster, Dorset	1	0	0
Legg, Job	Bridport, Dorset	1	1	0
Leir, Major W.	Combe-head, Bampton, N. Devon	1	0	0
Leney, H.	Blacklands, East Malling, Maidstone	1	1	0
*Lennard, Col. Sir J. Farnaby, Bart.	Wickham Court, Beckenham, Kent	3	0	0

Name.	Residence.	Subscriptions. £.	s.	d.
Lethbridge, Charles	Sherfield Manor, Basingstoke	1	0	0
†Lethbridge, J. C. Baron	Tregeare, Launceston		..	
*Lethbridge, W.	Courtlands, Lympstone	2	0	0
Leverton, W.	Woolleigh Barton, Beaford, North Devon	0	10	0
Lewis, James	Plasdraw, Aberdare	1	1	0
Lewis, Wm. and Son	*Herald* Office, Bath	1	0	0
†Ley, John Henry	Trehill, Exeter		..	
Liddon, J.	Great Toller, Dorchester	1	0	0
Lilwall Brothers	Shrub Hill, Worcester	1	1	0
Linzee, Robert Geo.	Broxmere Park, Romsey	1	0	0
Lippiatt, L.	Cloud Hill, Temple Cloud, Bristol	1	0	0
Lipscomb, R. H.	East Budleigh, Budleigh Salterton, Devon	1	1	0
†Lister, J. J.	Warninglid Grange, Haywards Heath		..	
Lister, R. A., and Co.	Dursley, Gloucestershire	1	1	0
Llewellyn, Evan H., M.P.	Langford Court, Langford, Bristol	1	1	0
Lloyd, Thomas	The Square, Winchester	1	0	0
Lock, J. C.	Saltford, near Bristol	1	0	0
†Locke, John Arthur	Northmoor, Dulverton		..	
Lockyer, C.	Gouts Mills, Bruton	1	0	0
Lockyer, G., and Son	St. Philip's Marsh, Bristol	1	0	0
Lodwicke, R. W.	Strete Raleigh, Exeter	1	0	0
Londesborough, Lord	Northerwood, Lyndhurst, Hants	1	0	0
Long, G.	Ogbourne St. Andrew, Marlborough	1	0	0
Long, Prof. J.	Graveley Manor, Stevenage	1	0	0
*†Long, Walter H., M.P.	Rood Ashton, Wilts		..	
Long, Walter Jervis	The Holt, Bishop's Waltham	1	0	0
Long, Col. William	Woodlands, Congresbury, Somerset	1	1	0
Long, William	Windmill Cottage, Oldbury-in-the-Hill, Chippenham	0	10	0
*Lopes, Sir M., Bart.	Maristow, Roborough, Devon	2	0	0
Lopes, H. Y. Buller	Maristow, Roborough, Plymouth	1	0	0
Lovelace, Amos	Winsford, Dulverton	0	10	0
Lovelace, Earl of	Ashley Coombe, Porlock, Somerset	1	0	0
*†Loyd, Lewis	Monk's Orchard, Bromley, Kent		..	
†Lubbock, Sir John, Bart., M.P.	High Elms, Hayes, Kent		..	
†Lutley, J. B.	Brockampton, Worcester		..	
Luttmann-Johnson, Jno.	Gostrode Farm, near Godalming	1	0	0
Luttrell, Capt. J., R.N.	Eddington, Bridgwater	1	0	0
Luttrell, Rev. A. F.	Quantoxhead, Bridgwater	1	0	0
Luttrell, Rev. A. H. F.	Minehead, Bridgwater	1	0	0
Luttrell, G. F.	Dunster Castle, Somerset	1	0	0
Luttrell, Col. H. A. F., C.B.	Badgworth Court, Axbridge, R. S. O., Somerset	1	0	0
Maby, C. R.	Storridge Farm, Westbury, Wilts	1	0	0
Macdonald, J., proprietor of the 'Farming World'	63, Princes St., Edinburgh	1	0	0
Macleay, Lt.-Col. A. C.	Glasshayes, Lyndhurst	1	0	0

Name.	Residence.	Subscriptions. £.	s.	d.
Maggs, C.	Dairy Factory, Melksham	1	0	0
Major, H. J., and C.	Bridgwater	1	0	0
Mallock, Richard	Cockington, Torquay	1	0	0
Manfield, J.	Hambridge, Curry Rivell, Taunton	1	0	0
*Mannington, J.	73, Middle St., Brighton	2	0	0
Marker, Richard	Combe, near Honiton	1	0	0
Marks, T.	Colleton Barton, Broadhenbury, Honiton	1	0	0
Marshall, Sons, and Co.	Britannia Iron Works, Gainsboro'.	1	1	0
Martin, Christopher	Broad Clyst, Exeter	0	10	0
†Martin, G. E.	Ham Court, Upton-on-Severn		..	
Martin, W.	Burrow, Broad Clyst, Exeter	0	10	0
*Mason, J.	Eynsham Hall, Oxon	2	0	0
Matthews, A. T.	Buckland, Faringdon	1	0	0
Mattock, Robert	Sowton House, Wellington	1	0	0
Maule, M. St. John	Chapel House, Bath	1	0	0
May, A. C.	Park House, Cotham Park, Bristol	1	0	0
†Mayo, Henry	Cokers Frome, Dorchester		..	
†Mayo, John	Wavey House, Upwey, Dorchester		..	
McMurtrie, J.	Southill, Radstock, near Bath	1	0	0
McNiven, Rev. C. M.	Perrysfield, Oxted, Redhill	1	1	0
Medland, R.	Penstone, Cullompton	1	0	0
Medland, W. R.	Yard Farm, Silverton, Cullompton	0	10	0
Medlicott, Henry E.	Potterne, Devizes	1	0	0
Merry, Richard	Goulds, Broad Clyst, Exeter	0	10	0
Merry, W. F.	Ash Clyst, Exeter	0	10	0
Merson, Thomas	Holcombe Rogus, Wellington, Somerset	0	10	0
Methuen, Hon. Col. P.	Corsham Court, Wilts	1	0	0
Micklem, H.	Rose Hill, Henley-on-Thames	1	0	0
Middleton, Hastings N.	Bradford Peverell, Dorchester.	1	0	0
Middleton, H. B.	Bradford Peverell, Dorset	1	0	0
*Mildmay, H. Bingham	Flete House, Ivybridge, Devon	2	2	0
Mildmay, Rev. A. St. J.	Denton Rectory, Harleston, Norfolk	1	0	0
*†Mildmay, Sir H. St. John, Bart.	Dogmersfield Park, Hartford Bridge, Winckfield		..	
Mildon, W. B.	North Street, Wellington, Somerset	0	10	6
†Miles, H. R.	Abbots Leigh, Clifton, Bristol		..	
†Miles, William Henry	Ham Green, near Bristol		..	
Milford, Thomas	Thorverton, Cullompton	1	0	0
Millard, H.	Shrivenham, Berks	1	0	0
Millard, J. C.	Eastcombe House, Olveston, near Almondsbury, Gloucester	1	0	0
Mills, A.	Efford Down, Bude Haven, Cornwall	1	0	0
†Mills, Robert	Theale, Slinfold		..	
Minton, T. S.	Montford, Shropshire, R.S.O.	1	0	0
Mirehouse, Henry	St. George's Hill, Easton-in-Gordano	1	1	0
†Mitchell, F. J.	Llanfreckfa Grange, Carleon, Mon.		..	
Monk-Bretton, Lord.	8, Seamore Place, London.	1	1	0

Name.	Residence.	Subscriptions. £.	s.	d.
Montefiore, Sir F., Bart.	Worth Park, Crawley	1	1	0
Moody, C.	Pylle, Shepton Mallet	1	0	0
Moody, R.	Pilton, Shepton Mallet	1	0	0
Moore, Frank R.	Littlecott Farm, Pewsey, Wilts	1	0	0
†Moore, H. F., F.C.S.	Frome	..		
*Moore-Stevens, J. C.	Winscott, Gt. Torrington	5	0	0
*Moreton, Lord	Tortworth Court, Falfield, R.S.O., Gloucestershire	2	2	0
Morgan, E. K.	Hambrook, near Bristol	1	0	0
Morgan, G. K.	Cherith Lodge, Clifton	1	1	0
Morgan-Richardson, C.	Noyadd Wilym, Cardigan	1	0	0
Morland, Charles W.	Ashcombe House, Lewes, Kent	1	1	0
*Morley, Earl of	Whiteway, Chudleigh, Devon	2	0	0
†Morley, H. H.	Hall Place, Tonbridge	..		
*Morrell, G. Herbert	Headington Hill Hall, Oxford	2	2	0
Morris, H. S.	Woolston Lodge, Southampton	1	0	0
Morris and Griffin	Elmsdale, Wolverhampton	1	1	0
†Morrison, Alfred	Fonthill House, Tisbury	..		
*Mount-Edgcumbe, Earl of	Mount-Edgcumbe, Devonport	2	2	0
†Mount, G. W.	Wasing Place, Reading	..		
Moysey, Rev. F. L.	91, Kensington Gardens Square, London, W.	1	1	0
*Moysey, H. G.	Bathealton Court, Wiveliscombe, Somerset	2	2	0
†Mucklow, E.	Castlehead Grange, Lancashire	..		
Mullock, R.	Newport, Mon.	1	1	0
Muntz, P. A., M.P.	Dunsmore, near Rugby	1	0	0
*Murch, Jerom	Cranwells, Bath (Mayor, 1864-6, 1876–8, 1887)	2	0	0
Murray-Anderdon, H. Edward	Henlade House, Taunton	1	1	0
Myddleton, Thomas	Beckjay, Ashton-on-Clun	1	0	0
Naper, Col. W. D.	Stanley Lodge, Exmouth	1	0	0
Napier, H. B.	Chippenham	1	0	0
Napper, G.	Lee Farm, Wisboro' Green, Billingshurst, Sussex	1	1	0
†Naylor, C. J.	Kerry, Montgomeryshire	..		
Neame, F.	Macknade, Faversham	1	1	0
†Neville-Grenville, Robert	Butleigh Court, Glastonbury	..		
Newbery, Samuel P.	Plympton St. Mary	1	0	0
Newton, F. M.	Barton Grange, Taunton	1	0	0
Newton, F. W.	Barton Grange, Taunton	1	0	0
†Newton, J. G.	Millaton House, Bridestowe, Okehampton	..		
Nichol, Rev. J. G. S.	Litchfield Rectory, Micheldever	1	0	0
Nicholets, J. T.	Manor House, Brent Knoll, Bridgwater	1	0	0
Nichols, George	Broad Street, Bristol	1	0	0
Nix, Mrs. S.	Tilgate, Crawley, Sussex	1	0	0
*Normanton, Earl of	Somerly, Ringwood, Hants	2	0	0
Norris, Charles	Motion, Broadclyst, near Exeter	1	0	0
Norrish, Thomas	Churchill Farm, Loxbeare, Tiverton	0	10	0

Name.	Residence.	Subscriptions. £.	s.	d.
Northcote, Rev. G. B. . .	Feniton Rectory, Honiton . . .	1	1	0
Northcote, Hon. Sir H. S., Bart.	7, Seamore Place, Mayfair, London	1	0	0
Northey, W. S.	Tinhay Lime Works, Lifton, Devon	1	0	0
*Northumberland, Duke of .	Albury Park, Surrey	5	0	0
Nosworthy, William . . .	Ford Manaton, Moreton-Hampstead	0	10	0
O'Donoghue, H.	Long Ashton, Bristol	1	0	0
Okeden, Col. U. P.	Turnworth, Blandford	1	0	0
Olde, Alfred	Grove, Launcells, Holsworthy .	0	10	0
Oliver, John	Manor House, Middlezoy, Bridgwater	1	0	0
Oliver, J.	Berkeley, Gloucester	1	0	0
Orange, J. H.	St. Brelades, Jersey	1	0	0
Osborn, J.	Chesterblade, Shepton Mallet .	1	0	0
Oxley, J. Stewart	Fen Place, Turner's Hill, Sussex	1	1	0
Ozanne, A. T.	Putron, Guernsey.	1	0	0
Page, Henry	Walmer Court, Walmer . . .	1	0	0
*Paget, Col. Sir R. H., Bt., M.P.	Cranmore Hall, Shepton-Mallet .	2	0	0
Pain, Charles	Longstock, Stockbridge, Hants .	1	1	0
Palairet, H. H.	Chatley House, Norton St. Philip, Bath	1	1	0
Palfreman, —	Ingrams Farm, Loxbeare, Tiverton	0	10	0
Palmer, G. W.	Elmhurst, Reading	1	0	0
Palmer, R.	Lodge Farm, Nazeing, Waltham Cross	1	1	0
Palmer, W.	Elbury, Broad Clyst, Exeter . .	1	0	0
Parker, Admiral	Delamore House, Ivybridge . .	1	0	0
†Parker, Hon. Cecil J. . . .	Eaton Estate Office, Eccleston, Chester	.	.	
Parker, J. S.	Freelands, Iffley, Oxford . . .	1	0	0
Parkin, Paxton William . .	3, Major Terrace, Seaton, Devon.	1	0	0
†Parmiter, Wm	The Axe, Crewkerne	.	.	
Parnell, T. P.	Wrington, R.S.O., near Bristol .	1	0	0
Parry, T.	Newport, Mon.	1	0	0
†Parsons, Henry	Misterton, Crewkerne	.	.	
Partridge, S. J.	Selworthy, Taunton	1	0	0
Pavord, A. C.	Maindiff Court Farm, Abergavenny	1	0	0
Pease, W. B.	Southstoke, Bath	1	0	0
Pember, G. H.	Tangier Park, Basingstoke . .	1	0	0
Pendarves, W. Cole . . .	Pendarves, Camborne, Cornwall .	1	1	0
Pendock, C.	Ditchen Farm, Mangotsfield . .	1	0	0
Penny, Thomas	Taunton	1	0	0
Percival, E. A.	Severn House, Henbury . . .	1	1	0
Perry-Keene, H.	Rowfant, Crawley, Sussex . . .	1	0	0
†Peters, Wm. Parsons . . .	Yealbridge, South Petherton . .	.	.	
Petherick, S.	Acland Barton, Landkey, Barnstaple	0	10	0
Petley, J. McLeod	Greenhouse, Bridgnorth . . .	1	1	0
Pettifer, Stephen	Crudwell, Tetbury	1	0	0

Name.	Residence.	Subscriptions. £.	s.	d.
Philp, Capt.	Pendoggett, Timsbury, near Bath	1	1	0
†Phillips, C. D.	Newport, Monmouth	.	.	
Phillips, G. Cawkwell	60, New Street, Chelmsford	1	0	0
*Phillpotts, Rev. Canon T.	Porthgwidden, Truro	2	0	0
Phipps, C. N. P.	Chalcot, Westbury	1	0	0
Phœnix Oil Mills Co.	Norfolk Street, Liverpool	1	1	0
Picksley, Sims, and Co., Lmtd.	Bedford Foundry, Leigh	1	0	0
Picard, J.	9, Vicarage Gate, Kensington, London	1	0	0
Pickett, S., jun.	Elcombe, Swindon	1	0	0
Piggott Brothers	59, Bishopsgate Street Without, London	1	0	0
Pigott, Cecil S.	Weston-Super-Mare	1	0	0
†Pinckney, Erlysman C.	Berwick St. James, Salisbury	.	.	
Pinney, F.	The Grange, Somerton	1	0	0
†Pinney, W.	Somerton	.	.	
†Pitt, Thomas, jun.	Southside Street, Plymouth	.	.	
†Pole, R. Chandos	Sydling Court, Sydling, Dorchester	.	.	
*Poltimore, Lord	Poltimore Park, Exeter.	3	3	0
Polwhele, Thos. R.	Polwhele, Truro	1	0	0
Pond, S.	Blandford, Dorset	1	0	0
Ponsford, T.	Minehead, Taunton	1	0	0
Ponsonby, L., Executors of	Terrick, Tring	1	0	0
Pool, Joseph	Coate, Martock, R.S.O.	0	10	0
Poole, A. R.	S. Brent, Somerset	1	0	0
Poole, J. R.	Bridgwater	1	0	0
Pope, Alfred	Dorchester	1	0	0
Pope, Henry	Cotleigh Court, near Honiton, Devon	1	0	0
Pope, John	The Shrubbery, Barnfield, Exeter	1	0	0
†Pope, Rev. W. J. P.	Godmanstone Rectory, Dorchester	.	.	
Porch, J. A.	Edgarley, Glastonbury	1	0	0
Portal, Colonel	Ashe Park, Micheldever, Hants	1	0	0
*Portal, Melville	Laverstoke House, Micheldever	2	0	0
Portal, Wyndham	Malshanger, Basingstoke	1	0	0
†Porter, Robert	Westfield House, South Lyncombe, Bath	.	.	
†Portman, C. B.	Bryanston, Blandford	.	.	
†Portman, E. W. D.	Durweston, Blandford	.	.	
*Portman, Viscount	Bryanston, Blandford	2	0	0
*Portsmouth, Earl of	Eggesford, North Devon	5	0	0
Poulett, The Earl	Hinton St. George, Crewkerne	1	0	0
Powell, R. H.	Lewes, Sussex	1	0	0
Powell, W. S.	Eglwysnunyd, Taibach	1	0	0
Pratt, Chas.	Wescot, Tallaton, Ottery St. Mary	1	0	0
Pratt, D.	Exmouth	1	0	0
Pridham, J. L.	Marine Villas, Paignton, Devon	1	0	0
*Prior, R. C. A.	Halse House, near Taunton	2	0	0
Proctor, H. and T.	Cathay, Bristol	1	1	0
Pulley, J., M.P.	Lower Eaton, near Hereford	1	0	0
†Punchard, W. H.	Bourton Hall, Totnes	.	.	
Purser, Edward, and Co.	116, Fenchurch St., London, E.C.	1	0	0

Name.	Residence.	Subscriptions. £.	s.	d.
Quibell Bros.	Newark	1	0	0
Quicke, Rev. C. P.	The Rectory, Ashbrittle, Wellington	1	0	0
Radmore, Henry T.	Court Barton, Thorverton, Devon	1	0	0
*Ramsden, J. C.	Busbridge Hall, Godalming	2	0	0
Randall, R.	Tockington House, Almondsbury, Gloucester	1	0	0
Ransome, James Edward	Orwell Works, Ipswich	1	1	0
Rashleigh, Jonathan	Minabilly, Par Station, Cornwall	1	0	0
Rawlence, James	Bulbridge, Wilton, Salisbury	1	1	0
Raynbird, Hugh E. and Son	The Auction Mart, Basingstoke	1	0	0
Read, Thomas	New Barn Farm, Chewton Keynsham, Bristol	1	0	0
Rees-Mogg, W. W.	Cholwell House, Cholwell, Bristol	1	0	0
Reeves, Robert and John, and Son	Bratton, Westbury, Wilts	1	0	0
Reid, A.	Livingshayes, Silverton	1	0	0
Reid, V. P.	Spring Grove, Milverton	1	0	0
Rendell, Hugh	Selworthy, Minehead	0	10	0
†Rendle, Robert	Catel Farm, Guernsey		. .	
*Revelstoke, Lord	Membland House, Ivybridge	2	2	0
Ribbeck, W. A.	Eastleaze Shaw, Swindon	1	0	0
Richards, Thomas	Wincanton, Somerset	0	10	0
*Richmond and Gordon, Duke of.	Goodwood, Chichester	5	0	0
Rickear, Silas	Newlyn East, Grampound Road, Cornwall	1	0	0
Ridler, James	Blackford, Selworthy, Minehead	1	0	0
Ridler, John	W. Lynch, Selworthy, Minehead	0	10	0
Ridler, T. K.	Minehead, Taunton	1	0	0
Ridley, Rev. N. J.	Hollington House, Newbury	1	0	0
Rigden, Henry	Lyminge, Hythe, Kent	1	0	0
Rigg, H. A.	Wykeham Lodge, Walton-on-Thames	1	0	0
*Rivers, Gen. Fox Pitt.	Rushmore Lodge, Ludwick, Salisbury	2	0	0
*Robartes, Lord	Lanhydroc, Bodmin	2	0	0
Roberts, E. A.	Greenhithe, Dartford, Kent	1	0	0
Roberts, J. D. Cramer	Highfield, Frant, Tunbr. Wells	1	1	0
Roberts, J., and Son	Bridgwater	1	1	0
Robey and Co.	Lincoln	1	0	0
Robins, J.	High Bray, South Molton	0	10	0
Robinson, S.	Lynhales, Kington, Herefordshire	1	0	0
Robinson, John, and Co.	Bristol	1	1	0
Robinson, W. J.	Monkton Farleigh, Bradford-on-Avon	1	1	0
Robson, William	Summerfield, Bournemouth	1	1	0
Rock, P.	Gratton, High Bray, S. Molton	1	0	0
†Roe, J. C.	Lynmouth, Lynton		. .	
†Rolls, John Allan	The Hendre, Monmouth		. .	

Name.	Residence.	Subscriptions. £. s. d.
Rossiter, James	Westown, R.S.O., near Bristol	1 0 0
Row, W. N.	Cove, Tiverton	1 0 0
Rowe, W.	Stratton, Cornwall	1 0 0
Ruegg, L. H.	*Journal*, Sherborne	0 10 0
Ruston and Proctor	Sheaf Iron Works, Lincoln	1 0 0
Sainsbury, Rev. S. L.	Beckington Rectory, Bath	1 0 0
*Saint Germans, Earl of	Port Elliot, Devonport	3 3 0
Salter, Benjamin	Newlands, Broad Clyst, Exeter	1 0 0
Salmon, H. C.	North Fields, Bridgwater	1 0 0
Samuelson, Sir B., M.P.	Banbury	1 0 0
Samuelson and Co.	Banbury	1 0 0
Sanders, E. A.	Stoke House, Exeter	1 0 0
†Sanders, E. J.	Stoke House, Exeter	. .
Sanders, T.	Conroy, Broad Clyst, Exeter	1 0 0
Sandvey, H. Poole	Launcelles, Holsworthy	1 0 0
Sanford, E. A.	Nynehead, Wellington	1 0 0
Sanford, W. A.	Nynehead, Wellington	1 0 0
Saunders, C. M.	Boracott, Brandiscorner, N. Devon	1 0 0
Saunders, Thomas Chapman	Watercombe Farm, Dorchester	1 0 0
Savidge, M.	Sarsden Lodge Farm, Chipping Norton	1 0 0
Savile, Col. H. B. O.	4, Rodney Place, Clifton	1 1 0
Scanes, H. J.	West Wood, Broad Clyst, Exeter	0 10 0
*Scobell, Col. Barton L. J.	Kingwell Hall, High Littleton, near Bristol	2 2 0
*Scratton, D. R.	Ogwell, Newton Abbott	2 2 0
Searle, J.	Legonna, Newquay, Cornwall.	1 0 0
Senior, H.	Rushton, Blandford, Dorset	1 0 0
Seward, Samuel N.	Weston, near Petersfield, Hants	1 0 0
*Seymour, Alfred	Knoyle House, Hindon	2 0 0
Seymour, A. G.	Hinton Farm, Chippenham	1 0 0
†Seymour, R. A. H.	The Farm, Preston Hall, Aylesford, Kent (Hon. Local Sec., 1884)	. .
Shackell, W.	20, Catherine Place, Bath	1 0 0
Shaw, Rev. G. F. E.	Edgworth Rectory, Cirencester	1 0 0
Shelley, Sir John, Bart.	Shobrooke Park, Crediton	1 1 0
Sherston, J. D.	Evercreech House, Evercreech	1 0 0
Shore, J. H.	Whatley House, Frome	1 0 0
Sillifant, A. O.	Coombe House, Coppleston, N.D.	1 0 0
Sim, W. C.	Knowle, Clyst-St. George, Topsham	1 1 0
Simmons, Chas. John	Langford, Somerset	1 1 0
†Simmons, Henry	Bearwood Farm, Wokingham	. .
Simpson, F. C.	Derwent Lodge, Dartmouth	1 0 0
*Simpson, Geo.	Wray Park, Reigate	2 0 0
Sinclair, A. J.	Newport, Mon.	1 0 0
Singer, John J.	Charcroft Farm, Bruham, near Bruton	0 10 0

Name.	Residence.	Subscriptions. £.	s.	d.
*Singer, W. M. G.	Streatfield, Paignton, Devon	5	0	0
Skinner, A.	Bratton Fleming, Barnstaple	0	10	0
Skinner, A. C.	Pound Farm, Bishops Lydiard, Taunton	1	0	0
*Skrine, Henry Duncan	Claverton Manor, Bath	2	0	0
Skrine, H. M.	Warleigh Manor, Bath	1	1	0
Slade, A. H.	Castle Hill, Addington, Surrey	1	1	0
Smith, H. J.	Stoke Abbott, Beaminster, Dorset	1	0	0
Smith, C., and Son	Caledonia Nurseries, Guernsey	1	0	0
Smith, Hugh C.	Mount Clare, Roehampton	1	0	0
Smith, J.	Stretford, Manchester	1	0	0
Smith, W.	Sundon House, Clifton Down, near Bristol	1	0	0
*Smith, Right Hon. W. H., M.P.	Greenlands, Henley-on-Thames	5	0	0
Smith, W. Hellier	West Newton, Bridgwater	1	0	0
*†Smyth, Sir J. H. Greville, Bart.	Ashton Court, Bristol	. .		
Snow, Edmund	The Quarries, Exeter	1	0	0
Somer, J.	Broadclyst, Exeter	1	0	0
†Somerville, A. F.	Dinder House, Wells	. .		
Sotheby, Rev. T. H.	Langford Budville, Wellington	1	1	0
†Spackman, Henry	Bath	. .		
Sparks, W.	Crewkerne	1	0	0
†Spearman, Sir J., Bart.	Llansannor Court, Cowbridge	. .		
Speed, W. S.	Mill Farm, Priston, Bath	1	0	0
Speke, W., jun.	Jordans, Ilminster	1	1	0
Spencer, J. M.	Oakhill, Bath	1	0	0
Spicer, Capt. J. W. Gooch	Spy Park, Chippenham	1	0	0
Spicer, C.	Manor Farm, Bishops Caundle, Sherborne	1	0	0
Spire, Joseph	High Street, Glastonbury	1	0	0
Spratts' Patent	Henry Street, Bermondsey, London	1	0	0
Spurway, Rev. Edward	Heathfield, Taunton	1	0	0
Squarey, E. P.	Salisbury	1	1	0
†Stacey, F. E.	Llandough Castle, Cowbridge	. .		
Stanbury, J. H.	Exeter	1	0	0
Stanford, E. and A.	Eatons, Steyning, Sussex	1	1	0
†Stanford, W.	Steyning, Sussex	. .		
Stanford, W. H. E.	Frylands, Henfield, Sussex	0	10	0
Stanhope, Rev. B. L. S.	Byford Rectory, Hereford	1	0	0
*Stanley, E. J.	Quantock Lodge, Bridgwater	2	0	0
Steeds, A.	Red House Farm, Stratton-on-the-Fosse, Bath	1	0	0
†Stephens, Darell	Trewornan, Wadebridge, Cornwall	. .		
Stevens, W.	Budlake, Broad Clyst, Exeter	1	0	0
Still, Henry	Addington House, Addington, Croydon	1	0	0
Stokes, Robert	Burroughs Hill, Salisbury	1	0	0
Stone, John S.	Newport, Monmouth	0	10	0
Story-Maskelyne, N., M.P.	Basset Down House, Swindon	1	0	0

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Name.	Residence.	Subscriptions. £.	s.	d.
†Strachey, E.	Pensford, Somerset	..		
Stratton, Richard	The Duffryn, Newport, Monmouth	1	0	0
*Strickland, A. L.	23, Warwick Square, London, S.W.	2	0	0
Stuckey, Vincent	Hill House, Langport	1	0	0
Stuckey, W. J.	Lambridge Lodge, Bath	1	0	0
*Stucley, Sir G. S., Bart.	Moreton, Bideford	2	0	0
Studdy, T. E.	Leckford Down, Stockbridge	1	0	0
Sturge, William	Bristol	1	1	0
Style, A. F.	Boxley House, Maidstone	1	0	0
Surtees, W. E.	Tainfield, Taunton	1	0	0
Sutton, John C.	Shirley, near Southampton	1	0	0
*Sutton, M. J.	Dyson's Wood, Kidmore, near Reading	2	0	0
*Sutton and Sons	(Seedsmen) Reading	2	2	0
Swanwick, R.	College Farm, Cirencester	1	0	0
Swayne, W. T.	Glastonbury	1	0	0
*Sydney, Earl	Frognal, Footscray	2	2	0
Tangyes (Limited)	Cornwall Works, Birmingham	1	0	0
Tanner, J. B.	King's Weston, Shirehampton, Bristol	1	0	0
Tapp, David James	Knaplock, Winsford, Dulverton	1	0	0
Tapp, John	Winsford, Dulverton	0	10	0
Tasker, W., and Sons	Andover	1	1	0
Tate, J. A.	Fairfield, Wells	1	0	0
Tayleure, C. W.	Hampton, St. Mary Church, Torquay	1	0	0
†Taylor, George	Stanton Prior, near Bristol	..		
Taylor, H. W.	Showle Court, Ledbury, Hereford	1	0	0
†Tazewell, W. H.	Manor House, Taunton St. Mary's	..		
Thomas, T. C.	The Parsonage, Brompton Ralph, Wiveliscombe	1	0	0
Thompson, John	Badminton, Chippenham	1	1	0
†Thorley, Joseph	Thornhill Bridge, Caledonian Road, King's Cross, London, N.	..		
Thorne, J.	West Yard, N. Molton	1	0	0
Thorne, J. G.	Horridge, Romansleigh, S. Molton	0	10	0
Thorne, John	Bradley, Winsford, Dulverton	0	10	0
Thorne, W.	.. ..	0	10	0
Thresher, John	Corfe Hill, Weymouth	1	0	0
Thring, Theodore	Alford House, Castle Cary	1	1	0
Throckmorton, Sir N. W., Bart.	Buckland, Faringdon, Berks	1	0	0
*Thynne, Lord H.	Maiden Bradley, Bath	2	0	0
Tilley, H.	Steam Bow Farm, Pilton, near Shepton Mallet	1	0	0
Titt, John Seymour	Milton Abbas, Blandford, Dorset	0	10	0
Titt, J. W.	Implement Maker, Warminster	1	0	0
*Tolcher, E. H. A.	Harewood, Plympton St. Mary	2	0	0
Tombs, Edward	Shilton, Bampton	1	0	0

Name.	Residence.	Sub- scriptions. £.	s.	d.
Treadwell, John	Upper Winchendon, Aylesbury	1	0	0
*Tredegar, Lord	Tredegar Park, Newport, Monmouth	2	2	0
Tremaine, James	Tregonning, Grampound Road, Cornwall	1	0	0
Tremaine, W. H.	Trerice, 'Newlyn, Grampound Road, Cornwall	1	0	0
Tremaine, W. H.	Sherborne, Northleach, Cheltenham	1	0	0
*†Tremayne, John	Heligan, St. Austell	..		
Trenen, W. T.	Degembris North, Newlyn East, Cornwall	0	10	0
Trevilian, E. B. Cely	Port Town, Taunton	1	0	0
Trickey, William	Kelston, Bath	1	0	0
Trinder, E.	Perrott's Brook, Cirencester	1	0	0
†Trood, Col. Robert	Matford, near Exeter	..		
*Troyte, Col.	Huntsham, Bampton, Devon	2	2	0
Tucker, R.	Bratton Fleming, Barnstaple	0	10	0
Tucker, W. D.	74, High Street, Southampton	1	0	0
Tudge, W.	Leinthall, Ludlow	1	0	0
†Tudway, C. C.	Cedars, Wells, Somerset	..		
†Turbervill, T. B.	Ewenny Priory, Bridgend	..		
Turner, J.	Backwell, Bristol	1	0	0
Unite, John	291, Edgware Road, London	1	0	0
Unwin, L.	Tiverton	1	0	0
Upperton, E. T.	Guildford (Mayor, 1871)	1	0	0
Van Hasselt, W. A.	Rotterdam, Holland	1	0	0
Vaughan, J.	Downfield Farm, Kingston, Hereford	1	0	0
Vellacott, H. W. Hopper	Stone Farm, Exford, Taunton	1	0	3
Vickress, T. A.	Hill, Slinfold, Horsham	1	0	0
Vipan and Headley	Leicester	1	0	0
Verney, Right Hon. Sir H.	Claydon House, Winston, Bucks	1	0	0
Vosper, W. P.	Saltram Farm, Plympton, Devon	1	0	0
Wainwright, Charles R.	Shepton Mallet	1	1	0
Wait, W. S.	Woodborough House, Bath	1	1	0
Walden, J.	Chilcombe, Bridport	1	0	0
Walker, Robert	The Quay, Bath	1	0	0
Wallis and Steevens	North Hants Iron Works, Basingstoke	1	0	0
*Walrond, Sir J. W., Bart.	Bradfield, Cullompton	2	2	0
Walrond, Col. W. Hood, M.P.	New Court, Topsham, Devon	1	0	0
†Walsingham, Lord	Merton Hall, Thetford, Norfolk	..		
†Walter, John	Bearwood, Wokingham	..		

Name.	Residence.	Sub-scriptions. £.	s.	d.
Wansay, A. H.	2, St. Stephen's Chambers, Baldwin Street, Bristol	1	1	0
Wantage, Lord, K.C.B., V.C.	Lockinge Park, Wantage	1	0	0
Warde, A. and F.	West Farleigh, Maidstone	1	0	0
†Warre, Frederick	44, Great Ormond Street, Bloomsbury, London	..		
Warre, Rev. E., D.D.	Eton College, Windsor	1	0	0
*Waterlow, W. B.	High Trees, Redhill, Surrey.	2	0	0
Waterlow Cake Mills	Wilmington, Hull	1	1	0
Watkins, W.	Hill Side, Maindee, Newport, Mon.	1	0	0
Watson, James	Melksham, Wilts	1	0	0
Watts, H. S.	Hendford, Yeovil	1	1	0
Watts, John	Gatcombe Farm, Bristol	1	0	0
Weatherly, F.	Hillside, Portishead, Bristol	1	0	0
Webb, E., and Sons	Wordesly, Stourbridge	1	0	0
Webb, J.	High Street, Kensington, London	1	0	0
Webb, William	Thickwood, Colerne	1	0	0
Webber, John	West Bagborough, Taunton	0	10	0
Wedmore, F. H.	Red House Farm, Stoke Bishop, Bristol	1	0	0
*Welman, C. Noel	Norton Manor, Taunton	2	2	0
Were, J. Kennet	Sidmouth	1	1	0
Westmacott, Rev. W.	Highbridge	1	0	0
Weston, T. W.	Royal Iron Works, Kettering	1	0	0
†*Weymouth, Viscount, M.P.	Longleat, Warminster	..		
White, Arthur J.	Wrangaton Manor House, Ivybridge	1	0	0
White, J.	Manor Farm, Zeals, Wilts	1	1	0
White, W. S.	Charnage, Mere, Bath	1	0	0
White, George	Hunton, Maidstone	1	0	0
White, H.	Cheese Factor, Frome	1	0	0
*†Whitehead, C., F.L.S.	Barming House, Maidstone	..		
*Whitehead, R.	Old Paddockhurst, Worth, Crawley	2	2	0
Whitting, C. E.	Sandcroft, Uphill, Weston-super-Mare	1	1	0
Wickham, W.	Binsted-Wyck, Alton	1	0	0
Wilcox, W. H., and Co.	36, Southwark Street, London	1	1	0
Wilkinson Brothers	Union Street, Bath	1	1	0
Wilkinson, Capt. G. W.	Risca, Mon.	1	0	0
Wilkinson, Capt. J.	The Fields, Newport, Mon.	1	0	0
Wilkinson, W.	Bacton Manor, Pontrilas	1	0	0
Willett, J. S.	Petticombe, Torrington	1	0	0
†Willett, P. A.	Ashcroft, Kingston-by-Sea, Sussex	..		
Williams, A. G.	St. George's Brewery, Portsea, Hants	1	0	0
Williams, Edward Wilmot	Herringston, Dorchester	1	0	0
Williams, C. J.	Carhyss Castle, Wellington Park, Launceston	1	0	0
Williams, Capt. J.	The Fields, Newport, Mon.	1	0	0
Williams, George	Wick Farm, Winsford, Dulverton	0	10	0
†Williams, J. A.	Brideshead, Dorchester	..		

Name.	Residence.	£.	s.	d.
Williams, M. H.	Pencalerick, Truro	1	0	0
Williams, Montague . . .	Woolland House, Blandford . .	1	0	0
†Williams, M. Scott . . .	Woolland House, Blandford . .		. .	
†Williams, Robert	Brideshead, Dorchester. . . .		. .	
†Williams, R., jun.	Brideshead, Dorchester		. .	
*Williams, Sir W. R., Bart. .	Heanton Court, near Barnstaple .	2	2	0
Willis, G.	Bunbury, Tarporley, Cheshire .	1	0	0
Willis, John Gale	Newton St. Loe, Bath	1	0	0
Willis, Joseph D.	Bapton, Codford, Wilts . . .	1	1	0
Wills, William Henry . . .	110, Redcliffe Street, Bristol . .	1	0	0
Willyams, Ed. W. Bridges .	Nanskeval, St. Columb, Cornwall	1	0	0
†Wilson, J. Wilson	Farmers' Club, Salisbury Hotel, Salisbury Sq., Fleet St., London		. .	
*Winchester, Marquis of . .	Amport St. Mary's, Andover .	2	0	0
*Windsor, Lord	Hewell Grange, Worcester . .	4	0	0
Winter, J. A.	Mansel House, Bridgwater . .	1	0	0
†Wintle, R. W.	Old Square, Lincoln's Inn, London		. .	
Winwood, T. H. R. . . .	Wellisford Manor, Wellington, Somerset.	1	0	0
Wippell, Richard	Rudway, Thorverton	1	0	0
Wise, W.	Midsomer Norton, Bath . . .	1	0	0
Wish, Thomas	Broadclyst, Exeter	0	10	0
†Wollocombe, J. B. . . .	Dunterton, Tavistock		. .	
Wood, Martyn H. G. . . .	*Gazette* Office, Bath.	1	0	0
Wood, J. Gaythorne . . .	Thedden Grange, Alton, Hants .	1	1	0
Wood, W. A.	36, Worship Street, London, E.C.	1	0	0
Woodard, Rev. Canon . . .	Henfield, Sussex	1	0	0
Woods, Thomas, Col. . . .	Llandaff Place, Llandaff . . .	1	0	0
Woolcombe, C. B.	Ashbury, Exbourne, N. Devon .	1	0	0
Worth, W.	Broad Clyst, Exeter	0	10	0
Wyatt, G. N.	Slough Place, Cuckfield, Sussex .	1	0	0
Wyatt, J.	Claverham, Yatton	1	0	0
Wyatt-Edgell, A.	Cowley House, Exeter	1	1	0
Yalland, J.	Manor House, Fishponds, Bristol	1	0	0
Yatman, Rev. J. A.	Winscombe Hill, Weston-Super-Mare	1	0	0
Young, J.	Pinfold, Sherborne, Dorset . .	1	0	0
(34) Total . . 1158				

Donations

RECEIVED BY THE SOCIETY SINCE ITS EXTENSION.

Name.	Residence.	Date.	£.	s.	d.
A. B. C.	. . . .	1875	1	0	0
Acland, Sir P. P. F. P., Bart.	Fairfield, Bridgwater . .	1852	10	0	0
" "	" "	1853	10	0	0
Acland, Sir T. D., Bart. . .	Killerton, Exeter	1853	10	0	0
Adair, Desmond	Heatherton, Taunton . .	1852	5	0	0
Adair, Alexander	Heatherton, Taunton . .	1853	5	0	0
Addington, Hon. W. W. (now Viscount Sidmouth) . . .	Up Ottery	1853	2	2	0
Arnold, G., jun.	Dolton, Crediton	1854	2	0	0
Ashburton, Lord (deceased) .	The Grange, Hants . . .	1854	10	0	0
Atherton, H.	. .	1881	1	0	0
Baker, Rev. R.	Compton Martin	. .	1	1	0
Bedford, Duke of (deceased) .	Endsleigh	1852	21	0	0
Bouverie, Hon. P. P.	Brymore, Bridgwater . .	1853	5	5	0
Brettle, Alfred	Combe Hay, Bath	1855	1	0	0
Brunel, I. K. (deceased) . .	Westminster	1852	5	0	0
Bryde, John Mac	Plymouth	1853	0	10	0
Burnard, Charles F.	Plymouth	. .	0	5	0
Busby, Wm.	Newton, near Bedale . .	1852	1	0	0
" "	" "	1853	5	0	0
Carrow, J. M. (deceased) . .	Stoberry, Wells	1852	1	0	0
Clark, J. A.	Street, Glastonbury . . .	1854	2	4	0
Clayton and Co.	Lincoln	1853	2	0	0
Cornes, James	Barbridge, Nantwich . .	1853	5	0	0
Corner, R.	Torweston, Taunton . .	1853	0	10	0
Cornish, J. T.	Lower Rixdale, Chudleigh	1879	1	1	0
Cornish, R. S.	Mayor of Exeter	1853	1	1	0
Coryton, A.	Pentillie Castle, Plymouth	1853	5	0	0
Divett, Edward (deceased) .	Bystock, Exeter	1852	10	0	0
Drake, Rev. —	Stourton Rectory	1853	1	0	0
" "	" "	1854	1	0	0
" "	" "	1855	1	0	0
Drewe, E. S.* (deceased) . .	The Grange, Honiton . .	. .	10	0	0
Durant, R.	Sharpham, Totnes . . .	1852	5	0	0
" "	" "	1853	5	0	0
Ebrington, Lord Visc. (now Earl Fortescue)	Castle Hill, South Molton	1853	5	0	0
" "	" "	1867	2	2	0
" "	" "	1868	5	0	0
Fox Brothers	Tonedale, Wellington . .	1855	5	0	0
Freeman, N.	Ashchurch, Tewkesbury .	1880	0	10	0
Friend, a, per J. W. King .	. .	1854	1	0	0
Garrett, Rev. C. F..	Eustone, Oxford.	1878	0	7	0
Gordon, C.	Gittisham, Honiton . . .	1855	1	0	0
Gordon, Charles	Wiscombe Park, Honiton	1875	1	3	4
Hensman and Son	Castleworks, Woburn . .	1852	1	0	0

* Originally paid as a life member, but afterwards became an annual subscriber of 2*l*. 2*s*., and his composition therefore appears as a donation.

Name.	Residence.	Date.	Amount.		
			£.	s.	d.
Hood, Sir A. A., Bart.	St. Audries	1852	10	0	0
" "	" "	1853	10	0	0
Horner, Rev. John	Mells Park, Frome . . .	1852	5	0	0
" "	" "	1853	5	0	0
Hoskins, Thomas	Haselbury, Crewkerne . .	1853	1	0	0
Huyshe, Rev. John	Clysthydon, Cullompton .	1855	5	0	0
Ilchester, Earl of (deceased)	London	1852	10	10	0
Johnson, W. B.	Glastonbury	1856	1	1	0
Keene, Messrs.	Bath	1853	0	10	6
Kennaway, Sir J., Bart. . . .	Escot	1852	10	0	0
" "	" "	1853	5	0	0
Knyfton, T. T.	Uphill	1852	5	0	0
" "	" "	1853	2	0	0
Ley, William (deceased) . .	Woodlands, Kenn	1853	3	3	0
" "	" "	1854	3	3	0
Lopes, Sir R., Bart. (deceased)	Maristow	1853	10	0	0
Marychurch and Co.	Haverfordwest	1855	2	0	0
Middleton, Henry	Cutteslowe, Oxford . . .	1875	0	10	6
Miles, Sir W., Bart.	Leigh Court	1853	5	0	0
Morley, S., M.P.	Tonbridge	1881	5	0	0
Naish, W. B.	Stone Easton	1852	5	0	0
Newman, Thomas	Mamhead	1853	10	0	0
Newton, J. G.	Bridestowe, Okehampton .	1854	2	0	0
" "	" "	1855	5	0	0
Northcote, Sir S.H., Bart., M.P.	Pynes	1853	10	0	0
Pearse, Rev. S. W.	Ivybridge	1853	1	0	0
Phillips, Dr.	Torquay	1853	1	0	0
Pincaird, G. S.	. .	1881	1	7	0
Portman, Viscount	Orchard Portman	1852	10	0	0
" "	"	1853	10	0	0
Radcliffe, Rev. W.	Warleigh, Plymouth . .	1853	5	0	0
Randell, Thomas	Market Rasen	1856	1	1	0
Riccard, J. E. J.	South Molton	1853	1	1	0
Sanders, Thomas (deceased) .	Park Street, Bristol . . .	1853	1	1	0
Scott, E. H.	Sandridge Park, Bromley	1875	26	5	0
Sidmouth, Viscount (deceased)	Up Ottery, Devon . . .	1853	5	0	0
Smith, A. K.	Kettering, Exeter	1852	4	4	0
Smith and Ashby	Stamford	1852	1	0	0
Sparks, W.	Crewkerne	1852	10	0	0
Synge, F. H. (deceased) . . .	Weston-super-Mare . . .	1852	1	0	0
Tayler, Robert	Ashclyst, Broadclyst . .	1853	0	10	0
Troyte, A. H. D. (deceased) .	Huntsham Court, Tiverton	1852	3	0	0
Uttermare, T. B.	Langport	1853	1	0	0
Walrond, W. H., M.P.	Exeter	1881	5	0	0
Welland, Rev. L. P.	Tallaton, Ottery	1856	0	10	0
Wightman and Dening . . .	Chard	1852	2	0	0
Willcox, Edmund	Godney, near Wells . . .	1854	0	10	0
Williams, James	Bath	1854	4	0	0
Wilson, John Wilson	Austin House, Broadway, Worcestershire	1875	0	15	0

DONATIONS FOR SPECIFIC PURPOSES.

Name.	Purpose.	Date.	Amount.
			£. s.
Acland, Sir T. D., Bart. (deceased) . . .	To Increase the Local Prizes at Barnstaple	1859	50 0
Acland, T. D., M.P., (now Sir T. D., Bart.)	Prizes for Flannel	1858	5 0
Best, J. C., R.N. .	For Black Welsh Cattle	1882	17 0
Brassey, H. A., M.P.	Prizes for Dairy Cattle	1884	50 0
Buller, J. W. (decd.)	Prizes for Ponies	1859	10 10
Gray, Jonathan . .	Prizes for Flannel	1858	5 0
Hood, Sir Alexander, Bart.	Addition to the Society's Prize for Two-year-old Colt for Agricultural purposes	1857	10 0
Knight, F. W. . .	Prizes for Exmoor sheep	1859	10 10
Marryatt, Horace .	Prizes for Honiton Lace	1879	5 0
Miles, William . .	Prizes for Shoeing Horses . . .	1859	6 6
,, ,, . .	,, ,, ...	1860	6 6
,, ,, . .	,, ,, ...	1861	6 6
,, ,, . .	,, ,, ...	1862	6 6
,, ,, . .	,, ,, ...	1863	6 6
,, ,, . .	,, ,, ...	1864	6 6
,, ,, . .	,, ,, ...	1865	6 6
,, ,, . .	,, ,, ...	1866	6 6
,, ,, . .	,, ,, ...	1867	6 6
,, ,, . .	,, ,, ...	1868	6 6
,, ,, . .	,, ,, ...	1869	6 6
,, ,, . .	,, ,, ...	1870	6 6
,, ,, . .	,, ,, ...	1871	6 0
,, ,, . .	,, ,, ...	1872	6 0
,, ,, . .	,, ,, ...	1873	6 6
,, ,, . .	,, ,, ...	1874	6 6
,, ,, . .	,, ,, ...	1875	6 6
,, ,, . .	,, ,, ...	1876	6 6
,, ,, . .	,, ,, ...	1877	6 6
,, ,, . .	,, ,, ...	1878	6 6
Moore-Stevens, J. C.	Prize for Honiton Lace	1876	25 0
,, ,,	,, ,, ...	1879	5 0
Morrell, G. H. . .	Prize for Langshans	1878	6 0
,, ,, . .	,, ,, ...	1879	6 0
,, ,, . .	,, ,, ...	1880	6 0
,, ,, . .	,, ,, ...	1881	6 0
,, ,, . .	,, ,, ...	1882	6 0
,, ,, . .	,, ,, ...	1883	6 0
,, ,, . .	,, ,, ...	1884	6 0
Morrison, Alfred . .	Special Prize for Hampshire Down Ram Lamb	1869	8 0
,, ,, . .	,, ,, ...	1871	6 0
Parker, H.	Towards Prizes for Hampshire Down Sheep	1854	10 10
Portsmouth, Earl of	Special Prize for Hampshire Down Ram Lamb	1869	10 0
,, ,,	,, ,, ...	1871	10 0
Sillifant, J. (deceased)	Prize for Devon Bull	1859	10

Name.	Purpose.	Date.	Amount.
			£. s.
Taylor, Chas. . . .	Towards Prizes for Hampshire Down Sheep	1854	0 10
The Barnstaple Local Committee . . .	For Local Prizes for Stock . . .	1859	85 0
The Bath Local Committee . .	For Local Prizes for Stock . . .	1877	60 0
" "	For Local Prizes for Cheese and Butter	1877	155 0
The Bridgwater Local Committee.	For Local Prizes for Stock . . .	1883	30 0
" "	For Prizes for Cheese and Butter .	1883	44 0
The Bristol Local Committee . .	For Local Prizes for Stock . . .	1864	106 0
Bristol Soc. of Merch. Venturers	For Local Prize for best Stallion .	1864	50 0
The Cardiff Local Committee . .	For Local Prizes for Stock . . .	1882	200 0
The Glamorganshire Agricultural Soc.	For Local Prizes for Stock . . .	1882	198 0
The Guildford Local Committee . . .	For Local Prizes for Stock, &c. . .	1871	110 0
The Hereford Local Committee . .	For Local Prizes for Stock, &c. . .	1865	358 0
The Maidstone Local Committee . . .	For Local Prizes for Stock, &c. . .	1884	310 5
The Oxfordshire Agricultural Society	For Local Prizes for Stock . . .	1878	100 0
The Salisbury Local Committee . . .	For Local Prizes for Stock . . .	1866	41 0
" "	For Local Prizes for Dogs . . .	1866	16 10
Sussex Herd-Bk. Soc.	For Local Prizes for Stock . . .	1881	34 0
" "	" " "	1884	33 0
Southampton Local Committee . . .	For Local Prizes for Stock, &c. . .	1868	122 0
The Tunb. Wells Local Committee	For Local Prizes for Stock . . .	1881	235 0
Trevelyan, Sir W. C. (deceased) . . .	For Prize Essay on Cider . . .	1858	25 0
Williams, C. C. . .	Prizes for Flannel and Implements	1858	23 0
Williams, Herbert (deceased) . . .	Special Prize, Dorchester	1872	10 0
Woolly, B. C. . .	Towards Prizes for Hampshire Down Sheep	1854	1 0
Woolly, W.	" " "	1854	0 10
Worcester Local Com.	For Local Prizes—Stock . . .	1880	199 0

SPECIAL DONATIONS.

	Date.	Amount.
		£. s. d.
Poultry Show at Plymouth, by Jonathan Gray . . .	1853	282 16 0
Poultry Show at Bath, by Jonathan Gray	1854	458 0 4

Subscriptions

FROM CITIES AND TOWNS SELECTED FOR THE SOCIETY'S MEETINGS.

	Date.	Amount. £.	s.	d.
Taunton, town of	1852	210	0	0
Plymouth, Devonport, and Stonehouse, towns of	1853	450	0	0
Bath, city of	1854	450	0	0
Tiverton, town of	1855	450	0	0
Yeovil, town of	1856	450	0	0
Newton Abbot, town of	1857	700	0	0
Cardiff, town of	1858	800	0	0
Barnstaple, town of	1859	800	0	0
Dorchester, town of	1860	900	0	0
Truro, town of	1861	900	0	0
Wells, city of	1862	900	0	0
Exeter, city of	1863	900	0	0
Bristol, city of	1864	1000	0	0
Hereford, city of	1865	900	0	0
Salisbury, city of	1866	900	0	0
Falmouth, town of	1868	900	0	0
Southampton, town of	1869	900	0	0
Taunton, town of	1870	900	0	0
Guildford, town of	1871	900	0	0
Dorchester, town of	1872	800	0	0
Plymouth, town of	1873	800	0	0
Bristol, city of	1874	800	0	0

	Date.	Amo
		£.
Croydon, town of	1875	800
Hereford, city of	1876	800
Bath, city of	1877	800
Oxford, city of	1878	800
Exeter, city of	1879	800
Worcester, city of	1880	800
Tunbridge Wells, town of	1881	800
Cardiff, town of	1882	800
Bridgwater, town of	1883	800
Maidstone, town of	1884	800
Brighton, town of	1885	800
Bristol, city of	1886	800
Dorchester, town of	1887	800
Newport (Mon.) town of	1888	800

DONATIONS TO THE ARTS DEPARTMENT,

COLLECTED BY THE SPECIAL SUBSCRIPTION COMMITTEE.

EDWARD SIMCOE DREWE, *Chairman.*

BARNSTAPLE MEETING, 1859.

	£.	s.	d.
Addington, Hon. W. W.	1	0	0
Acland, Sir T. D., Bart. .	10	0	0
Acland, Sir P. P. Peregrine, Bart.	10	0	0
Acland, T. D.	5	0	0
Acland, Henry Wentworth, M.D.	1	1	0
Ashworth, E.	1	0	0
Bedford, His Grace the Duke of	10	0	0
Bremridge, R. (Mayor of Barnstaple)	3	3	0
Boutcher, W.	3	3	0
Buller, J. Wentworth, M.P.	2	0	0
Bradley, John	0	10	0
Bullock, G.	5	0	0
Belfield, J.	2	0	0
Brown, G.	1	1	0
Clinton, Right Hon. Lord	5	0	0
Clifford, Right Hon. Lord	5	0	0
Churston, Right Hon. Lord	5	0	0
Cotton, R. W. . . .	1	1	0
Cuthbertson, W. . . .	1	1	0
Cotterell, J. H. . . .	2	2	0
Cornish, James . . .	2	0	0
Chanter, J.	1	1	0
Devon, Right Hon. Earl of	2	0	0
Ducie, Right Hon. Earl of (Lord Lieut. of Gloucestershire)	5	5	0
Drewe, E. S.	5	0	0
Daw, J.	3	3	0
Durrant, Bosville . . .	1	1	0
Dinham, J.	1	1	0
Down, G.	1	1	0
Digby, G. W.	5	0	0
Durant, R.	5	5	0
Dorville, H.	0	10	0
Fortescue, Right Hon. the Earl (Lord Lieut. of Devon)	5	0	0
Franklin, George . . .	1	1	0
Friend, a	0	10	0
Gard, R. S., M.P. . . .	5	5	0
Gray, Jonathan . . .	5	5	0
Grenville, R. Neville . .	5	0	0
Garratt, J.	2	0	0
Goodwin, J.	1	1	0
Hood, Sir Alex. Acland, Bart.	5	0	0
Hussey, T.	0	10	0
Hodge, H.	0	10	0
Heberden, Rev. W. . .	2	2	0
Huyshe, Rev. J. . . .	2	0	0
Hayward, J.	1	1	0
Hoare, P. R.	5	0	0
Hippisley, J. H. (High Sheriff of Devon) . .	5	0	0
Heathcoat and Co. . . .	5	0	0
Honey, W. J.	1	1	0
Ilchester, Right Hon. Earl	5	0	0
Jeboult, H. P.	1	1	0
Kennaway, Sir J., Bart. .	2	2	0
Kemp, James	1	0	0
Kekewich, S. T., M.P. .	5	0	0
Lindsay, Hon. Colin . .	2	2	0
Lopes, Sir Massey, Bart., M.P.	5	5	0
Locke, J. A.	5	0	0
Latimer, Thomas . . .	2	2	0
Miles, W.	10	0	0
Macready, W. C. . . .	2	2	0
Minton and Co. . . .	5	5	0
Miller, A. R.	1	1	0
Moysey, H. G.	2	2	0
Newman, Thomas . .	10	0	0
Ogilvie, R.	1	1	0

	£.	s.	d.
Portsmouth, Right Hon. Earl	10	0	0
Portman, Right Hon. Lord (Lord Lieut. of Somerset)	5	0	0
Poltimore, Right Hon. Lord	5	0	0
Prideaux, Sir E. S., Bart.	2	2	0
Poole, Gabriel S.	5	0	0
Pitman, S.	3	3	0
Pycroft, G.	2	0	0
Pyke, Capt., R.N.	1	0	0
Pasmore and Savery	1	1	0
Rolle, Hon. Mark	10	0	0
Roberts, W.	1	1	0
Rowe, Mark	1	1	0
Sillifant, J. (President) (*deceased*)	10	0	0
Sanford, W. Ayshford	1	0	0
Stucley, Sir G. S., Bart.	10	0	0
Talbot de Malahide, Right Hon. Lord	5	0	0
Trefusis, Hon. Charles, M.P.	3	3	0
Throckmorton, Sir R., Bart.	5	0	0
Trevelyan, Sir Walter, Bart.	5	0	0
Tyrrell, John (Recorder of Barnstaple)	5	5	0
Templeton, J.	1	1	0
Thomas, J. L., and Co.	1	1	0
Upcot, W.	1	1	0
Uttermare, T. B.	2	2	0
Vidal, E. U.	1	1	0
Veitch, James, sen.	1	1	0
Williams, the Lady Mary Hamlyn, Clovelly Court	5	0	0
Walrond, J. W.	3	3	0
Woolmer, J. N.	2	2	0
Woolmer, Rev. C. E. S.	2	2	0
Wippell, G., and Sons	1	0	0
Wippell, Joseph	0	10	0
Wassell, Albert	1	1	0
Whitaker, W. (County Surveyor)	3	3	0
White, A.	0	10	0
Williams, C. Croft	2	2	0
Wall, —	1	1	0
Wilcocks, J.	1	1	0
Ward, P., London	1	1	0
Yelland, W.	1	1	0

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Vol. XX. Third Serie[s]

JOURNAL OF THE

BATH

AND

WEST OF ENGLAND SOCIETY

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